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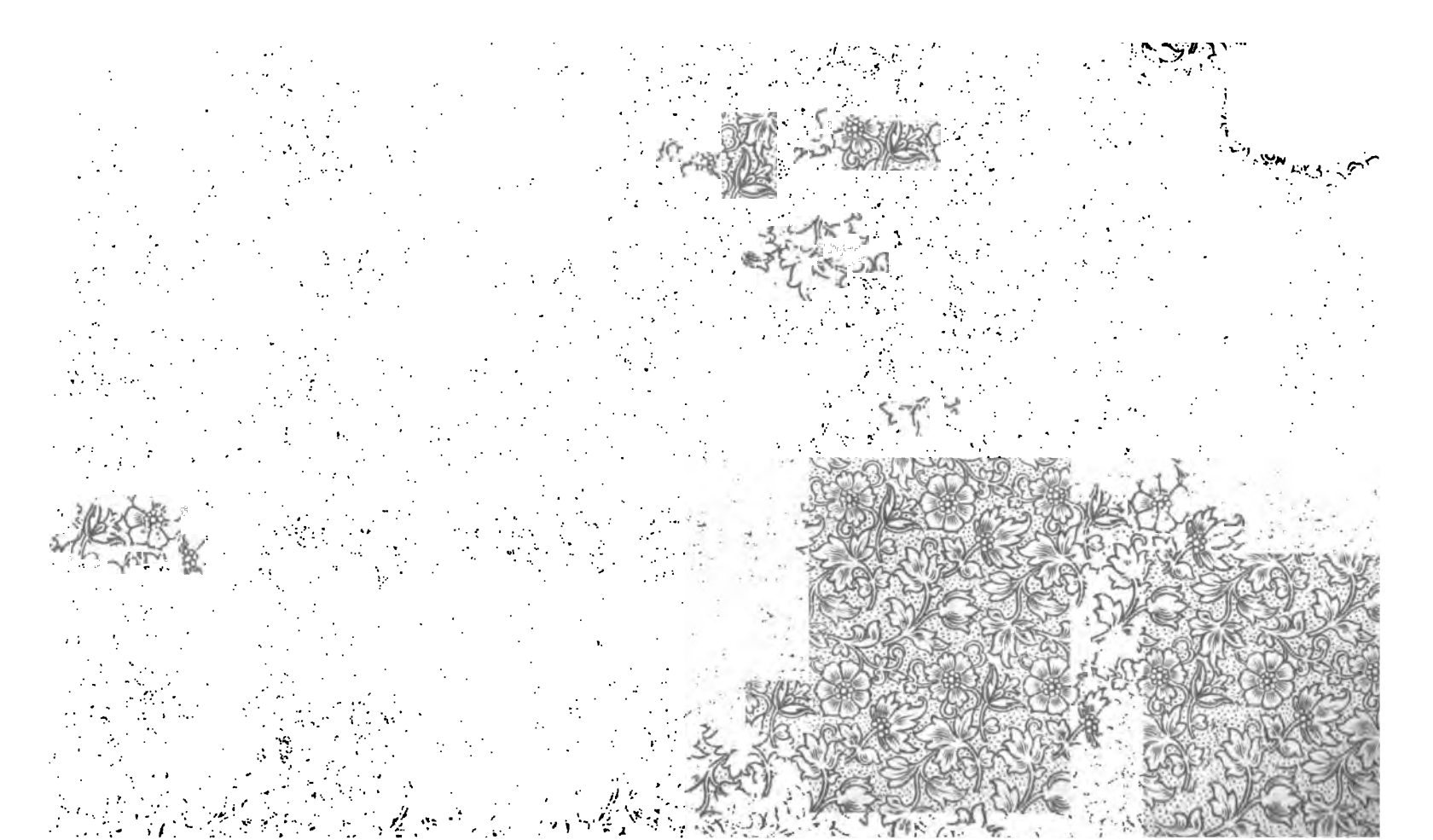

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Torrey Botanical Club,

NOVEMBER 30th, 1896.

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MEMOIRS

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Studies of the Types of various Species of the Genus Carex.

BY L. H. BAILEY.

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Vol. I.] [No. 1.

STUDIES OF THE TYPES OF VARIOUS SPECIES OF THE GENUS CAREX.

Notes on Carex.—XI.*

By L. H. BAILEY.

(Read Feb. 12, 1889),

An attempt has been made during the past year to see all the existing types of North American species of *Carex*. These types are widely scattered, largely in the Old World, and the whereabouts of many of them have been entirely unknown. Many of them had never been seen by a student of the genus since their publication, and there was reason to believe that some species which had been seen by our earlier botanists have not been properly comprehended in the light of our fuller knowledge. The examination has proved that many of our catalogued species are fictitious, and that considerable changes in nomenclature must be made. However much such radical changes are to be regretted, they are nevertheless unavoidable if priority of publication is to be considered; and there is the surety that in the future changes must be very few. The very oldest types have been seen, so far as they are known to exist, and almost every name which has been applied to North American species is accounted for and under-

* Earlier numbers were published as follows: I. Bot. Gaz. ix. 117–122, (Aug., 1884); II. Bot. Gaz. ix. 137–141, (Sept., 1884); III. Bot. Gaz. x. 203–208, (Jan., 1885); IV. Bot. Gaz. x. 293–295, (June, 1885); V. Bot. Gaz. x. 317–319, (Aug., 1885); VI. Bot. Gaz. x. 379–382, (Nov., 1885); VII. Proc. Amer. Acad. Arts and Sci. xxii. 59-157, (1886); VIII. Bot. Gaz. xi. 328–330, (Dec., 1886); IX. Bot. Gaz. xiii. 82-89, (Apr., 1888); X. Journ. Bot. xxvi. 321–323, (Nov., 1888).

stood. It is therefore evident that any further changes in the names of our species must be almost entirely such as rest upon judgments of the systematic merits of accepted species and varieties.

The writer upholds the use of the oldest published name or combination, in every instance. This principle is applied to the names of varieties with the same care as to those of species. He also adopts a particular variety as the type of each variable species, rather than use the specific name as a loose and collective appellation for all the forms of the species. This type, in every case, so far as originals exist, is the form which the author first described, independently of any apparent indications as to its relative importance. Thus some of our common species are emended; *e. g.*: *Carex straminea*, *C. laxiflora*, *C. striata*, *C. debilis*, *C. salina*, and others. The writer has given varietal names only to those forms which assume a considerable degree of permanence under various conditions, and the combining of which would lead to confusion in the knowledge of the species. He has no sympathy with that ultra-refinement of classification which gives names to specimens rather than to species and their larger variations. Such refinements serve no useful purpose, and do not merit the name of science. Few plants possess more clearly marked characteristics than do the Carices, when once the species are well understood and allowance is made for incidental variations; but when these incidental variations are confined by written descriptions and dignified by names, confusion unavoidably arises.

The collections to which the writer has had access are as follows, the abbreviation in the parenthesis being the character by which each is designated in the text below: 1. The collection of Linnæus (Hb. Linn.), deposited with the Linnæan Society, Piccadilly, London. The carices are comprised in three small fascicles, and are well preserved. Many of them possess little value, however, owing to the fact that they are not the specimens which Linnæus described. Some of the specimens are not named. 2. The large and valuable herbarium of Dr. Francis Boott (Hb. Boott.), now forming a part of the collections of Kew. 3. The herbarium of John Carey (Hb. Carey.), also at Kew. 4. That of Samuel Goodenough (Hb. Kew.), and, 5, of J. Gay (Hb. Kew.), both

at Kew. 6. The small but valuable collection of Edward Rudge (Hb. Kens.), at the Natural History Museum of the British Museum, at South Kensington, London. 7. The northern species described by Robert Brown (Hb. Kens.), at South Kensington. At South Kensington are also the herbaria of Thomas Walter, Ehrhart, Shuttleworth, and others. 8. The collection of Scandinavian plants made by Wahlenberg, at Upsala (Hb. Wahl.). At Upsala is also the herbarium of Thunberg. 9. A portion of Wahlenberg's North American species, deposited in the Naturhistoriska Riksmuseum at Stockholm, (Hb. Holm.). Some of Wahlenberg's types are not in existence, so far as known, but they are such as are pretty clearly defined by collateral evidence. The collection of Swartz, also at Stockholm, contains three of Wahlenberg's types. (*C. polystachya*, *C. cladostachya* and *C. scabrella.*). 10. The very complete and invaluable collection of arctic carices at Copenhagen (Hb. Havn.), comprising the types of Drejer, Lange, and others. 11. The types of the Mexican and Central American species founded by Liebmann, also at Copenhagen, in the herbaria of Liebmann (Hb. Liebm.) and Œrsted (Hb. Œrst.). 12. Willdenow's collections (Hb. Willd.) at Berlin. This herbarium contains most of the types of Muhlenberg and Schkuhr. The specimens were probably furnished entirely by Muhlenberg to Willdenow, and by Willdenow lent to Schkuhr. It appears from comparisons of Willdenow's specimens with Schkuhr's plates, that most if not all of the specimens from which the drawings were made, were returned to Willdenow. Duplicates were retained by Schkuhr. 13. The large general collections at the Imperial Botanic Museum at Berlin (Hb. Berol.), containing the types of Bœckeler, and some of those of Kunth, and other authors. 14. The collection of Schkuhr (Hb. Schk.) at Halle. 15. The specimens representing Presl's types of Reliquiæ Hænkeanæ, at Prague (Hb. Presl.). 16. The old herbarium of Allioni (Hb. All.) at Turin, Italy. Some of Allioni's types are not in existence, so far as known, and it appears that some of his species are founded solely upon Haller's descriptions. 17. The plants of Lamarck (Hb. Lam.) at the Jardin des Plantes, Paris. This invaluable collection has but recently been added to the large collections at Paris, by purchase from the estate of the

late Professor Rœper, of Rostock. 18. Michaux's collection (Hb. Michx.), also at Paris. 19. The general collection at the Jardin des Plantes (Hb. Paris.). 20. The herbarium of Steudel (Hb. Steud.), now in the possession of the Comte de Francqueville, and kept in Paris. I was allowed to inspect this collection through the courtesy of the proprietor, and his secretary, M. Jules Poisson. Many of the perplexing species of Steudel are not represented in his own herbarium. Those which are founded upon Drummond's collections, I have been able largely to identify at Kew, Berlin, and Cambridge, Mass. Two species described by Steudel and attributed to Chamisso are said, in the text, to have been founded upon specimens in the herbarium of Lenormand. I therefore went to Calvados, and found in, 21, the collection of Lenormand at Caen (Hb. Lenorm.), nearly all the remaining ambiguous species of Steudel. 22. The collections at Columbia College, New York (Hb. Torr.), in which are many types of American authors. 23. The collections at Harvard (Hb. Gray.), very rich in American material. 24. The herbarium of the late William Boott, now at Cambridge, Mass. 25. The collection of Schweinitz (Hb. Schw.), in the possession of the Philadelphia Academy of Sciences, and kindly loaned me by the Academy through the courtesy of the curator, J. H. Redfield. With this collection, I also had that of Zaccheus Collins. 26. Dewey's annotated and augmented set of Sartwell's Exsiccatæ, loaned me by the authorities of Williams College. In addition to these herbaria, I have had access to many smaller collections in many places. I have not been able to find the types of Scheele, but his descriptions leave little doubt as to the identity of his species.* Steudel's *Carex Preslii* (founded upon Presl's *C. leporina*), is not clearly accounted for.

The abbreviation v. s. (*vidi siccam*, "I have seen a dried specimen") indicates that I have seen the original specimen upon which the species in question was founded. Following the description of a new species, I have added a number in parenthesis to indicate the position the species should occupy in my Synopsis. (Proc. Amer. Acad. Arts and Sci. xxii. 1886).

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*C. *tetrastachys*, C. *Rœmeriana*, C. *scaberrima*, C. *variegata*.

1.—CAREX CEPHALOIDEA, Dewey, Cat. Pl. Mass. 262 (1840), v. s.; Sartw. Exsicc. No. 21 (1848), v. s.

C. muricata, L., var. *cephaloidea*, Dewey, Sill. Journ. (I.) xi. 308 (1826).

C. cephalophora, Muhl., var. (?) *β.*, Torr. Monog. 289 (1836).

C. sparganioides, Muhl., var. *cephaloidea*, Carey, Gray's Man. 1st. Ed. 513 (1848) v. s. Hb. Carey.

Distinguished from *C. cephalophora*, Muhl., with which it is commonly confounded, by its greater size, much broader leaves, its more numerous (5 to 10) spikes, which are disposed in an interrupted head an inch or more long, and larger and longer-pointed perigynia and shorter scales. It also resembles small and short headed forms of *C. sparganioides*, Muhl., from which, however, it appears to be abundantly distinct. In some cases it counterfeits *C. straminea*, Schk. var. *mirabilis*, Tuckm., but is at once separated by the position of the staminate flowers.— Copses, mostly in shade, from Western Massachusetts to Michigan. (251a).

This species has been a source of great perplexity to students of the genus, owing, as it now transpires, to the fact that two species have been united by some, and that the name has been wholly transferred from one species to the other by others. Boott describes another species as *C. cephaloidea*, and Dewey himself accepted the transfer of the name (Sill. Journ. 1866, 326), and left his original species nameless. The other species, with which this has been confounded, may be called—

2.—CAREX GRAVIDA.

C. cephaloidea, Sartw. Exsicc. No. 75 (1848), v. s.; Boott, Ill. 123 t. 395 (1862), v. s. Hb. Boott.; Dewey, Sill. Journ. (II.), xli. 326 (1866); Olney, Exsicc. fasc. iv. No. 15 (1871), v. s.; Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 141 (1886).

Most like *C. alopecoidea*, Tuckm.: culm thinner, more sharply three-angled; spikes few (four to seven), globular or broader than long, all contiguous and forming a small and oblong simple head; perigynium about twice larger than in *C. alopecoidea*, not stipitate, more abruptly contracted at the top, gravid, somewhat polished, conspicuously spreading; leaves narrow and very long-pointed. (239a).

Northern Illinois, *Vasey*, *Bebb*, to Northwestern Iowa, *Cratty*.

Var. LAXIFOLIA.

Much larger (2 to 3½ ft. high), the leaves broad and lax, and much less conspicuously pointed than in the species; head large and dense, ovoid or oblong, scarcely interrupted.

Northern Illinois, *Bebb*, Martin Co., Minn., *Cratty*, Fort Pierre, Dakota, *Hayden*, Wyoming, *Mc Shea*. Possibly specifically distinct.

3.—CAREX SPRETA.

C. stylosa, Meyer, var. *virens*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 79 (1886).

Larger and stouter than *C. stylosa* (18 in. high), and the leaves broader and longer; spikes short and thick (a half inch or less long), all closely sessile, the upper two or three contiguous to the staminate spike; perigynium very broad, thin, green, nerveless, longer and much broader than the black and muticous, faintly white-nerved scale. (63a).

Sauvie's Island, Oregon, *Howell*. Said by Howell to form part of the sedge pasturage of the Columbia.

4.—CAREX ELEOCHARIS.

One of the Vigneæ, perhaps allied to *C. tenella*, Schk.: Very slender but stiff, half a foot high, both leaves and culm filiform and smooth; spikes two or three, each bearing from one to three flowers, closely aggregated into a very small and apparently monostachyous head, evidently staminate above; perigynium short-ovate, turgid, flat on the inner face, marginless and nerveless, dull brown, beak entire or nearly so, as long as or longer than the thin-hyaline scale (247a ?).

Saskatchewan Plains, 1872, *Macoun*, No. 1665; distributed as *C. glareosa*, Wahl. A singular and ambiguous little species (Hb. Kew. and Hb. Bailey.).

5.—CAREX EXSICCATA.

C. vesicaria, L., var. *major*, Boott, Hook. Fl. Bor. Am. ii. 221 (1840).

C. vesicaria, L., var. *β.*, Boott, Ill. 162 t. 537 (1867), v. s. Hb. Boott.

C. vesicaria, L., var. *lanceolata*, Olney, Proc. Amer. Acad. Arts and Sci. viii. 407 (1872), v. s. Hb. Gray.

Differs at once from *C. vesicaria* by its greater size and broader leaves, thicker and more nearly sessile spikes, and particularly by the much longer, lance-ovate, scarcely inflated, duller

and strongly nerved perigynium, which is three to four times longer than the very narrow and muticous scale. In some of its forms it strongly suggests *C. trichocarpa*, Muhl., var. *aristata*, Bailey (21a).

Oregon, *Hall*, Sauvie's Island, *Howell*, base of Mt. Hood, *Henderson*.

Var. GLOBOSA.

C. vesicaria, L., var. *globosa*, Olney, Proc. Amer. Acad. Arts and Sci. viii. 408 (1872), v. s. Hb. Gray.

More slender than the species, the leaves narrow (⅓ in. or less wide); spikes small (an inch or less long), more or less scattered, closely sessile, rusty in color; perigynium narrower, conspicuously spreading; scale hyaline and very small.—Oregon, *Hall*, base of Mt. Hood, *Henderson*, Mt. Adams, Washington, *Howell*, Vancouver Island, *Macoun*.

Var. PUNGENS.

Slender; spikes narrowly cylindrical (the size of a pencil), one to two inches long, usually dark colored; scales firm, very sharp pointed, half or a third as long as the perigynium.—Wet places, Vancouver Island, 1887, *Macoun*, Nos. 46 and 47.

6.—CAREX SALTUENSIS.

C. vaginata, Tausch, var. *alto-caulis*, Dewey, Sill. Jour. (II.), xli. 227 (1866).

C. vaginata, Gray, Man., 5th ed., 586 (1868) and all American authors.

C. panicea, L., var. *refracta*, Olney, Exsicc. fasc. i. No. 24 (1871).

The study of much material leads me to separate this American species from the European *C. vaginata*, Tausch. I have also seen *C. vaginata* growing in Scotland, and again in Germany; the American species in its native woods is familiar. When our species was first discovered in the United States, by J. A. Paine, in 1865, Professor Dewey drew characters of separation between it and the European plant, but with the meagre material at his command, elevated the distinctions only to varietal value. From the European plant, *C. saltuensis* is separated by its much more slender and less cæspitose habit, narrower leaves and less conspicuous sheaths, its alternately-flowered spikes, and its much smaller, less inflated, and conspicuously nerved perigynium.—Labrador, *Turner*, to Northern Vermont, *Pringle*, Western New

York, *Paine*, Michigan, Minnesota, and westward to McLeod's Lake, British Columbia, lat. 55°, *Macoun*.

7.—CAREX SARTWELLII, Dewey, Sill. Journ. (I.) xliii. 90, (1842); Sartw. Exsicc. No. 12 (1848).

C. intermedia, Dewey, Sill. Journ. (II.) iv. 343 (1847) in part.

C. disticha, Sartw. Exsicc. No. 71 (1848); Boott, Ill. t. 410, excl. f. 2 (1862); Olney, Exsicc. fasc. iv. No. 26 (1871) v. s. and American authors in general.

C. disticha, Huds. var. *Sartwellii*, Dewey, Sill. Journ. (II.) xli. 330 (1866).

The American plant is abundantly distinct from the European *C. disticha*, Huds., although Dewey declared (Sill. Journ. 1866, 330) that "specimens precisely like the varying forms of *C. Sartwellii* have come to me from the north of Europe," and Boott (Ill. 126) could "see no characters to distinguish *C. Sartwellii* from the European *C. disticha*." Dr. Boott, however, was well aware of the differences between the two species, and pointed them out, but intermediate specimens from France and Germany confounded him. All these intermediate forms are immature, but they are nevertheless clearly distinct from the American plant. The European forms which closely approach *C. Sartwellii* are poorly developed and uncharacteristic specimens. Our plant is distinguished as follows: Plant more strict; spikes much shorter and rounder (ovate-oblong and pointed in *C. disticha*), about equally developed throughout and giving the lighter colored head a narrower and more symmetrical outline (in *C. disticha* the lower spikes are most fully developed, and the whole upper part of the head is often staminate, causing the head to appear bushy); perigynium much shorter and smaller, less prominently nerved.—New York to Utah and Montana, and British America.

Carex Sartwelliana, Olney, Proc. Amer. Acad. Arts and Sci. vii. 396 (1868), may be known as CAREX YOSEMITANA.

8.—CAREX COREANA.

C. retrorsa, Schw., var. *minor*, Boott, in herb. distrib.

Culm erect and stout, a foot or foot and a half high, smooth; leaves broad, shorter than the culm; lower bract broad and erect and much surpassing the culm; spikes one to three, short and

thick (an inch long and half or more as broad), sessile, or the lowest sometimes short stalked, approximated or aggregated; perigynium turgid and many-nerved, shining, straw-colored, thin, ascending, produced into a conspicuous and toothed beak; scale short ovate, blunt or muticous and hispidulous at the tip.—Port Chusan, Corea, 1859, *C. Wilford*, No. 927. Hb. Boott., Hb. Kew. and Hb. Berol. Its nearest ally is *C. bullata*, Schk.

9.—CAREX CALIFORNICA.

C. polymorpha, W. Boott, Bot. Calif. ii. 247 (1880), v. s. Hb. Torr. and Hb. Gray.

Differs from *C. polymorpha*, Muhl., in its smaller size and more slender habit, and much narrower leaves, and particularly by its nearly entire and much shorter beaked perigynia. (170a). Mendocino, California, *Bolander*, 4741.

10.—CAREX ALBIDA.

C. Cherokeensis, W. Boott, Bot. Calif. ii. 248 (1880), v. s.

Allied to *C. gynodynama*, Olney, and *C. luzulina*, Olney: Leaves narrow, smooth or slightly rough on the edges; spikes scattered, very short (about half an inch), whitish, the two staminate stalked, the pistillate sessile or nearly so; perigynium very gradually beaked (lance-ovate), the teeth small and erect, inconspicuously nerved, rough on the angles above; scales white-hyaline with a very thin margin, broadly ovate and obtuse or very abruptly short-pointed, the tip hairy, shorter than the perigynium. (94a). California, Santa Rosa Creek, *Thurber*, *Bigelow* (Hb. Boott. and Hb. Torr.)

11.—CAREX PERTENUIS.

One of the *Polystachyæ:* Plant bright green, the lower sheaths dark brown, slender, a foot to a foot and a half high, the culm smooth; leaves long-pointed, finely and sharply serrate on the margins, usually somewhat shorter than the culm; bracts sheathing, the lowest leafy and surpassing the culm; spikes four or five, very slender (1½ to 3 inches long), on filiform peduncles an inch or so long, divergent or drooping, alternately flowered below, the staminate portion (at the apex) short; perigynium elliptic, trigonous, pointed at both ends, sometimes slightly curved, the orifice entire, smooth and green, finely striate, somewhat longer than the broad and brown abruptly rough-awned scale. (108a). Orizaba, Mexico, Müller 1337 and 1338, Hb. Kew., Hb. Paris. and Hb. Torr.

12.—CAREX NOVA, Bailey, Journ. Bot. xxvi. 322 (1888).

C. nigra, Olney, Exsicc. fasc. v. 24 (1871), v. s.

C. atrata, L., var. *nigra*, Olney, Bot. King's Rep. 371 (1871); W. Boott, Bot. Calif. ii. 239 (1880); Bailey, Coulter's Man. 388 (1885), Proc. Amer. Acad. Arts and Sci. xxii. 77 (1886.)

Differs constantly from *C. atrata*, L., as follows: Spikes three or four, globular, strictly sessile, and very densely aggregated into an ovoid-triangular head, the lower spikes of which are squarrose, or the lower one rarely distinct; perigynium broadly ovate or nearly circular in outline, thin and whitish, very conspicuously squarrose, broader than the ovate and muticous black scale. (50a.) Mountains, Colorado to California.

13.—CAREX ATRATA, L., var. OVATA, Boott, Ill. 114, t. 362 (1862), Bailey, Journ. Bot. xxvi. 321 (1888).

C. ovata, Rudge, Linn. Trans. vii. 96, t. 9 (1804), v. s. Hb. Kens.

C. atrata, American authors.

Habitually more slender than the species and usually lower; spikes small, oblong or oblong-ovate, reddish-brown, slenderly peduncled. White Mountains, Smuggler's Notch, Vermont, *Brainerd*, and Labrador, Hb. Rudge.

Var. DISCOLOR, Bailey, Journ. Bot. xxvi. 321 (1888).

C. atrata, L., var., W. Boott, Wheeler's Survey 100th Merid. vii. 278 (1878) v. s. Hb. Gray.

C. atrata, var. *ovata*, Bailey, Coulter's Man. 388 (1885), Proc. Amer. Acad. Arts and Sci. xxii. 77 (1886).

Tall and slender; spikes narrowly cylindrical (an inch or two long and a fourth inch or less wide), the lower one or two on slender peduncles or even radical, the terminal one bearing a very long and much contracted staminate portion; perigynium greenish-white, conspicuously broader and usually longer than the black-purple and faintly white-nerved scale. A pretty plant. Colorado to Arizona, on the mountains.

14.—CAREX LURIDA, Wahl., Köngl. Acad. Handl. xxiv. 153 (1803), v. s. Hb. Holm.

C. tentaculata, Muhl.; Willd. Sp. Pl. iv. 266 (1805); Schk.,

Riedgr. Nachtr. 53, t. Ggg. f. 130 (1806); v. s. Hb. Willd. and Hb. Schk. (Founded upon abnormal specimens).

C. rostrata, Willd., Sp. Pl. iv. 282 (1805), v. s. Hb. Willd. and Hb. Schk.

C. gigantea, Kunth, Enum. Pl. ii. 503 (1837), v. s. Hb. Berol.

C. Purshii, Olney, Exsicc. fasc. i. No. 30 (1871), v. s.

C. Beyrichiana, Bœckl., Linnæa, xli. 239 (1876), v. s. Hb. Berol.

Nine years after Wahlenberg had published his *Carex lurida*, he stated (Fl. Lapp. 250) that it is the same as Schkuhr's figure of *C. lupulina*, Muhl. I therefore used his name for *C. lupulina* in my Synopsis (Proc. Amer. Acad. Arts and Sci. xxii. 63, 1886). In the Riksmuseum there are two sheets labelled *C. lurida* by Wahlenberg. One is from Hultgren, the original collector, and from this the description is made. This plant is the *C. tentaculata* of Muhl.! The other sheet, evidently a later acquisition, is from Muhlenberg, and is *C. lupulina*, Muhl., var. *pedunculata*, Dewey. It is evident that Wahlenberg confounded the two species. *C. lurida* is a variable species, particularly in the size and shape of the spikes, but I am able to separate only one form as worthy varietal recognition:

Var. GRACILIS.

C. tentaculata, Muhl., var. *gracilis*, Boott, Ill. 94 (1860).

Small and slender, bearing about two small erect pistillate spikes which are densely cylindrical and very narrow. Mountains of Vermont and New Hampshire, and in Pennsylvania and Tennessee.

15.—CAREX LUPULINA, Muhl., Willd. Sp. Pl. iv. 266 (1805); Schk., Riedgr., Nachtr. 54, tt. Ddd. f. 123; Iii. f. 194 (1806); v. s. Hb. Willd. and Hb. Schk.

C. lurida, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 63 (1886).

Carex lupulina is a variable and perplexing species. The type is characterized by its very thick and short spikes (1½ to 2 inches long and an inch or more wide), which are strictly sessile, or the lower one short-peduncled, and contiguous into a great

bunchy head; staminate spike small and sessile, usually partially hidden in the head; perigynium large and much inflated, conspicuously ascending. From this hop-headed form (whence its name), which is comparatively uncommon, the species runs almost imperceptibly into many more slender variations. Those worthy of varietal distinction are as follows:

Var. BELLA-VILLA.

C. Bella-villa, Dewey, Sill. Journ. (II.) xli. 229 (1866), v. s.

C. lurida, var. *divergens*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 63 (1886).

Plant much more slender; spikes scattered or remote, oblong or cylindrical, loosely flowered and more or less staminate at the apex; perigynium much more slender and more gradually beaked, more straw-colored, diverging at right angles; scales longer and conspicuously awned. This singular plant has nearly as much the aspect, in its spikes and perigynia, of *C. folliculata* as of *C. lupulina*, and in my Synopsis I suggested that it may be a hybrid of the two species. Professor Macoun states, however, (Cat. Can. Pl. iv. 168, 1888), that "it cannot be a hybrid with *C. folliculata*, as that species has never been found within one hundred miles of the locality." Near Belleville, Hastings Co., Ontario, *Macoun*.

Var. PEDUNCULATA, Dewey, Wood's Bot. and Fl. 376 (1870).

C. folliculata, Lam., Dict. Bot. iii. 391 (1789), v. s. Hb. Lam.

C. gigantea, Rudge, Linn. Trans. vii. 99 f. 2 (1804), v. s. Hb. Kens.

C. Canadensis, Dewey, Sill. Journ. (II.) xli. 229 (1866), v. s.

C. lupulina, var. *longipedunculata*, Sartw. in herb.; Dudley, Cayuga Fl., 119 (1886), v. s. Hb. Cornell.

C. lurida, Wahl., var. *polystachya*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 63 (1886), mostly.

Usually more slender than the species; spikes much narrower and smaller, (½ to ¾ in. wide and ½ to 2 in. long), more or less scattered, a part or all of them peduncled, the lower ones sometimes long-exserted; staminate spike usually conspicuous, often long-peduncled; perigynium usually smaller. A polymorphous variety, more common than the species, extending from Canada

to the Gulf. It is commonly mistaken in its larger forms for the:

Var. POLYSTACHYA, Schw. and Torr., Monogr. 337 (1825), v. s. Hb. Schw.

C. lupuliformis, Sartw. Exsicc. No. 147 (1848), v. s.; Boott, Ill. 61, t. 163.

C. lurida, Wahl., var. *polystachya*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 63 (1886), in part.

Stout and very leafy; spikes four to six, very large and heavy at maturity, but narrower than in the species (2 to 4 in. long and ¾ in. wide), cylindrical, alternately disposed, all, or particularly the lower, short-peduncled, erect, the lowest one or two subtended by broad, leafy bracts which far exceed the culm; staminate spike 2 to 4 inches long, sessile, or at least not conspicuously peduncled; perigynium large and much inflated, somewhat spreading, bright straw-colored at full maturity; scales hispid at the tip. The characters which particularly distinguish this plant from var. *pedunculata* are the long and cylindrical spikes, the great bracts, shorter peduncled staminate spike, and more spreading perigynia. Distinct in appearance. New York and New Jersey; not common.

15*a*.—C. LUPULINA×RETRORSA, Dudley, Cayuga Flora, 119 (1886), v. s. Hb. Cornell.

C lupulina, var. *gigantoidea*, Dewey, Sill. Journ. (II.) xli. 328 (1866).

C. lurida×*retrorsa*, Bailey, Bot. Gaz. xiii. 88 (1888).

16.—CAREX GRANDIS.

C. gigantea, Dewey, Sill. Journ. (I.), xi. 164 (1826), (II.) xli. 329 (1866), Wood's Class Book, 1860, 767; Boott, Ill. 61, t. 164 (1858), v. s. Hb. Boott.; Carey, Gray's Man, 4th. ed. 533 (1862), v. s. Hb. Gray.; Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 64 (1886).

Very like *C. lupulina*, Muhl., var. *polystachya*, Schw. & Torr., from which it is distinguished by its much more scattered and slim spikes, which are more loosely flowered; perigynium very abruptly contracted into a slender beak three or four times as long as the body, spreading at right angles or very nearly so, little inflated, never becoming straw-colored; scales narrower, smooth. A much more graceful carex than the other, with mature specimens of which it can never be confounded. Boott's

figures distinguish the two admirably. Kentucky, *Short*, Delaware, *Canby*, *Commons*, and southward.

17.—CAREX HOODII, Boott, Hook. Fl. Bor.-Am. ii. 211, t. 211 (1840), and Ill. 17 (Excl. Thurber's No. 16), t. 46 (1858), v. s. Hb. Boott.

C. muricata, Linn., var. *confixa*, Bailey, Bot. Gaz. x. 203 (1885).

Tall and slender, but erect, the culm (1 to 2 ft. high) prolonged beyond the leaves; spikes several to many, very few-flowered, compacted into an ovoid or oblong head three-fourths inch or less long; perigynium spreading, small and narrow, gradually contracted at both ends, green, nerveless or nearly so, conspicuously green-wing-margined, rough on the angles, about the length of the brown or tawny scale. (239b.) Montana, Idaho, Oregon and Washington.

Var. NERVOSA.

Very tall and slender, (2 to 3 feet high); head looser; perigynium browner throughout, more prominently winged, conspicuously nerved on the outer face. California, *Kellogg* and *Harford*, 1069; Marsh at Seattle, Washington, *Howell*.

18.—CAREX OCCIDENTALIS.

C. muricata, Olney, Bot. King's Rep. 362, in part (1871); W. Boott, Bot. Wheeler's Surv. 277 (1878); Bailey, Coulter's Man. 390 (1885).

C. muricata, L., var. *Americana*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 140 (1886).

Glaucous; leaves narrower than in the last, and relatively longer; spikes more or less scattered into a very slender head an inch or so long, the lowest one or two usually wholly distinct; bracts scale-like, inconspicuous; perigynium larger than in the last, turgid-ovate, abruptly short-beaked, nearly marginless and often smooth; scales muticous. (239c.) Mountains, Montana to Arizona.

19.—CAREX HOOKERIANA, Dewey, Sill. Journ. (I.) xxix. 248, f. 75 (1836).

C. muricata, L., var. *gracilis*, Boott, Ill. 193.

Very slender; head interrupted, castaneous, small, the spikes sometimes alternately arranged; bracts of the two or three lower spikes produced into long awns, which surpass the spikes; peri-

gynium small, green, usually lightly nerved, gradually produced into a beak which is cut into sharp awl-like teeth. (238a.) Utah to California and northward.

20.—CAREX TENUIROSTRIS, Olney, Parry's Bot. Obs. in W. Wyoming, in Amer. Nat. 1874, 24, v. s. Hb. Gray.*

C. Bonplandii, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 152 (1886).

To be compared with *Carex festiva*, Dew. and *C. Preslii*, Steud. Low (3 to 8 in. high), stiff and erect, the leaves very narrow and long-pointed, somewhat shorter than the culm; head small, ovate (a half inch or less long), very light brown; perigynium lanceolate and nearly terete below, slightly concave but marginless above, gradually narrowed into a point, lightly many-nerved, (particularly on the back), about the length of the lanceolate and acute hyaline-margined scale. (287a.) I have seen Kunth's original *C. Bonplandii* at Berlin, and it is essentially different from this plant. So far as I can judge from materials at my command, Boott's *C. Purdiei* is distinct from *C. Bonplandii*, although referred to that species by himself. The peculiar boat-shaped and marginless perigynia of *C. tenuirostris* distinguish it from both the above South American species, and from *C. festiva* and *C. Preslii*. N. W. Wyoming, *Parry*, 284, and Summit Valley, Cal., *Pringle*.

21.—CAREX ILLOTA.

C. Bonplandii, Kunth? var. *minor*, Boott, Proc. Acad. Phila. 1863, 77, v. s. Hb. Gray.; Olney, Bot. King's Rep. 365 (1871), v. s. Hb. Gray., and Exsicc. fasc. 3, No. 3 (1871), v. s.

C. Bonplandii, var. *angustifolia*, W. Boott, Bot. Calif. ii. 233 (1880), v. s. Hb. Gray.; Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 153 (1886).

Distinguished from small forms of *C. festiva*, Dew., as follows: Very slender and usually tall (6 in. to 19 in.), the head very small and globular or short-oblong (⅓ in. or less in diameter); perigynium completely marginless, thick below, stipitate, nerved, entirely smooth on the edges, the cylindrical and scarcely-cut beak projecting beyond the obtuse or muticous dark brown scale.

* *Carex tenuirostris*, Bœckl. is a more recent species.

(270a.) The perigynia are considerably like those of the *C. canescens* group. The species stands midway between *C. festiva* and *C. Heleonastes*. Mountains, Colorado to California; evidently not common. I have seen the original of *C. Bonplandii* var. *angustifolia*, Boott, from South America, and it bears no immediate relation to this plant. Boott, in founding his *C. Bonplandii* var. *minor*, remarks, "perigyniis ad marginis rarissime scabris," but his specimens have perfectly smooth fruit. He must have confounded with them some of the weak forms of *C. festiva*.

22.—CAREX JONESII.

Allied to *C. nervina*, Bailey, and *C. stipata*, Muhl.: Slender, but erect and somewhat stiff (7 to 18 in. high); culm sharply angled and rough, somewhat exceeding the narrow leaves; spikes several to many, densely aggregated into a small oblong or ovoid head (an inch or less long), which is bractless; perigynium small, lanceolate from a truncate base, stipitate, very strongly many-nerved, marginless, smooth or but slightly rough on the angles above, the long and brown beak nearly entire; scale brown, muticous or obtuse, somewhat shorter than the perigynium. Readily distinguished from *C. nervina* by its narrow and sharp culm, narrow leaves, simple head, and the absence of sponginess at the base of the perigynium. (230a.) Soda Springs, Nevada Co., Cal., 7,000 feet, 1881, *M. E. Jones;* Cascade Mts. 4,000 feet, Washington, 1882, *Tweedy*. Hb. Bailey.

23.—CAREX NUDATA, W. Boott, var. ANGUSTIFOLIA.

C. aperta, Boott, var. *angustifolia*, Boott, Hook. Fl. Bor.-Am. ii. 218 (1840), v. s. Hb. Boott., and Hb. Gray.

C. cæspitosa, L., var. *filifolia*, Boott in part, Ill. 182 (1867); Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 80 (1886).

Differs from *C. nudata* in its much more slender and lax habit, and narrower leaves; spikes short (¾ in. or less), sessile or nearly so; perigynium shorter and relatively broader, much more abruptly contracted above, faintly nerved. The leading feature of *C. nudata* is its slim, almost lanceolate perigynium, which is empty above. Fort Good Hope, Mackenzie's River, lat. 67°, *Richardson;* Cascade Mountains, about lat. 49°, *Lyall;* Trask River, Tillamook, Oregon, *Howell, Henderson*.

Carex cæspitosa, L., does not occur in America, so far as known. I inserted it in my Synopsis (1886, p. 80), upon the authority both of Drejer (Greenland), and Dr. Boott. The plant

referred here by Drejer (Rev. Crit. Car. Bor. 37, 38) is *C. vulgaris*, Fries (v. s. Hb. Havn., and teste Lange). Lange, Fl. Groen. i. 144, remarks, "Neque *C. stricta*, Good., neque vera *C. cæspitosa*, L. (*C. Pacifica*, Drej.) in Groenlandia unquam lectæ sunt." The specimens referred to this species by Boott are too young for determination, although it is certain that they are not *C. cæspitosa*, L. Bœckeler says that the species occurs in British America, but the remark is without foundation. Last autumn I made the acquaintance of *C. cæspitosa*, growing in Norway; there are no North American plants, which I have seen, that can be referred to any form of this species.

Var. ANOMALA.

Very slender (18 in. to 30 in. high), the culm and leaves very rough; leaves very numerous and long and narrow; spikes three to five, the lowest one or two on long and very slender peduncles, very narrow and thinly-flowered at base (one to two inches long), greenish or brownish (never purple-black as in the species and the last variety), the terminal one often pistillate at the top or throughout; perigynium firmer in texture, long and often very slender, granular and prominently nerved, green or greenish-yellow, longer than the narrow and brown obtuse scale. Oregon: Cascade Mountains, *Howell* (distr. as *C. lenticularis*, Michx.); Lost Lake, *Henderson*, 1786. Often has the aspect of *C. prasina*, Wahl.

24.—CAREX KELLOGGII, W. Boott, Bot. Cal. ii. 240 (1880), v. s. Hb. Gray.

C. acuta, L. var. *pallida*, Boott, Ill. 166, v. s.

C. vulgaris, Fries, var. *juncella*, Olney, in part, and excl. syn., Bot. King's Rep. 368 (1871); Bailey, Coulter's Man. 386 (1885).

This plant is not the *C. vulgaris* var. *juncella* of Fries, authentic specimens of which I have seen. Neither is it certain that our plant merits specific rank, although for the present it may be thus treated. It appears to be nearer *C. lenticularis*, Michx., than *C. vulgaris*, and is probably to be regarded as the western form of the former. The profuse and long-pointed leaves and essential characters of the perigynium point strongly to such a relationship. On the other hand, it is distinguished from *C. lenticularis* by its greenness, scattered spikes, always wholly staminate terminal spike, and longer pointed and stronger nerved green

perigynium. Indeed, it is doubtful if most of the western plants which have been referred to *C. vulgaris* do not belong to this apparently green form of *C. lenticularis*. Undoubted *C. lenticularis* was collected in 1858 by Lyall, in the Oregon Boundary Survey (Sumass Prairie, 49°), and probably Brewer's 2099, from California, is the same.

Another plant which has been referred to *C. lenticularis*, in California, seems to merit provisionally, at least, the following disposal:

25.—CAREX INTERRUPTA, Bœckl., var. IMPRESSA.

Spikes mostly shorter (usually an inch or less), little or not at all attenuated at the base, the lowest one not as long-peduncled; perigynium considerably larger, strongly few-nerved.—Summit Camp, Cal., *Kellogg*, Yosemite Valley, *Bolander*, 6198, p.p. The plant provisionally referred, in my Synopsis (p. 87), to *C. acuta* var. *pallida*, Boott, said to have been collected in Maine by Blake or Porter, and distributed by Olney as *C. lenticularis*, is *C. interrupta*, var. *impressa*. The plant apparently belongs to Kellogg's collection, coming into some of Olney's sets by mistake.

26.—CAREX VARIABILIS.

C. limula, Olney, Bot. King's Rep. 367 (1871) v. s. Hb. Gray.
C. aquatilis, W. Boott, Bot. Wheeler's Surv. 277 (1878) v. s. Hb. Gray.
C. aquatilis, var. W. Boott, l. c., v. s. Hb. Gray.
C. stricta, Bailey, Coulter's Man. 385 (1885).
C. aperta, Boott, var. *divaricata*, Bailey, l. c.

Glaucous; mostly low (2 ft. or less high), stout; culm sharply angled, roughish on the angles; leaves rather broad (as compared with *C. stricta*, Lam.); spikes three or four, short and stout (2 in. or less long), borne near the top of the culm, erect, the lower one or two conspicuously attenuated at the base, and appearing clavate, the upper sessile, lower peduncled; bracts leaf-like and broad, the lower one or two equalling or exceeding the culm; perigynium small and broadly ovate, abruptly and very shortly beaked, nerveless, beak entire, green or whitish, conspicuously broader and usually shorter than the obtuse or muticous black scale. (*72a*). Colorado, *Vasey* 582, *Hall* & *Harbour* 616 in

part, *Parry*, Twin Lakes, *Wolf* 1037, alpine bogs, Leadville and Ute Pass, *Trelease*, wet places near Empire, 8,500 ft., and damp places along Clear Creek, 8–9,000 ft., *Patterson*. Wyoming, *Parry* 279, Yellowstone Falls, *Letterman*.

Var. ELATIOR.

Much taller, the leaves very long and narrower; spikes longer (often 3 to 4 in.) and more slender, the lower much attenuated below, the upper bearing conspicuous staminate portions; bracts long and narrow. Canon City, Colorado, *Brandegee*; open thickets, Morley, "Foot-hills of Rocky Mts.," and Donald, Columbia Valley, B. C., *Macoun*.

Carex stricta, Lam., and its var. *decora*, Bailey, do not occur west of Nebraska, so far as I am aware.* Many unsatisfactory specimens have been referred to this species by various writers, but as fast as complete and abundant specimens come to hand, they are easily placed elsewhere. *C. variabilis* appears to be abundantly distinct from all other species, but the var. *elatior* varies towards *C. stricta*, var. *Emoryi*, Bailey, and *C. aquatilis*, Wahl. From the former, the above characterizations readily distinguish it. *C. aquatilis* is marked by its abundance of comparatively broad and long leaves and bracts, the solid spikes, very broad perigynia, and minor characters; its limits, particularly in our West, are very imperfectly understood, and material is yet scant.

27.—CAREX AURICULATA.

C. Jamesii, W. Boott, in part, Bot. Cal. ii. 243 (1880) v. s. Hb. Gray.

Between *C. stricta*, Lam., and *C. Nebraskensis*, Dewey: Culm slender but erect, sharply angled, mostly longer than the long-pointed leaves (2 ft. high); staminate spike one (or a rudimentary one sometimes borne at its base), short (½ to 1 inch long), short-peduncled; pistillate spikes two to four, short (an inch or less long, or the lowest sometimes longer and somewhat attenuated below), closely sessile or the lowest one very short-peduncled, cylindrical and closely flowered, the lowest usually subtended by a leafy, slender bract two or three inches long the base of which is normally somewhat hyaline and dilated, the other spikes

*C. *angustata*, W. Boott, Bot. Cal. ii. 242 (v. s. Hb. Gray.) appears to be a narrow-spiked form of *C. Hallii*, Bailey.

closely subtended by a very short (2 to 3 lines) and broad white hyaline auricle; perigynium small, ovate, flat and soft, gradually narrowed into a very short and entire beak, finely puncticulate, very lightly few-nerved or nerveless, much longer and broader than the obtuse and black broadly white-nerved scale. (73a.) California: Coloma, *N. J. Andersson*, 1852, Hb. Holm.; Clark's Ranch and Yosemite Valley, *Bolander* 6208 and 6212. The specimens at Stockholm, represented by three full sheets, and which I take as the type, differ in no important respect from those collected by Bolander. The leaves are somewhat rougher, and the base of the bract is more prominently auricled.

28.—CAREX USTA.

C. Douglasii, Boott, var. *brunnea*, Olney, Bot. King's Rep 363 (1871) v. s. Hb. Gray.; W. Boott, Bot. Cal. ii. 231 (1880· v. s. Hb. Gray.; Bailey, Coulter's Man., 393 (1885), Proc. Amer. Acad. Arts and Sci. xxii. 138 (1886).

Culm slender (one to two feet high) roughish above, mostly longer than the narrow leaves; spikes five to ten, staminate above, the lower two or three distinct, the remainder aggregated, the whole forming an interrupted narrowly oblong fulvous head two inches or less long; bracts dilated and scale-like, acuminate, fulvous, shorter than the spike, or the lowest one sometimes longer; perigynium lance-ovate, narrowly margined, hairy on the angles above, produced into a long and minutely toothed beak; scales thin, brown, hyaline-margined, obtuse or muticous, longer than the perigynium. (242a). Carson City, Nevada, *Watson* 1226; California, *Bolander* 4549 and 4550; also Bolander 4503, *teste* Olney and W. Boott, and Coulter 805, California, *teste* Olney. This plant bears no immediate relation to *C. Douglasii*, Boott, and its reference to that species is so manifestly erroneous that I venture the present disposition, although all the specimens are immature. *C. Douglasii* is diœcious, has large and congested heads, which are greenish-white in color, smooth perigynia, which are minutely cleft on the back of the beak, and excessively long styles, all of which characters separate it widely from the plant in question. The long styles of *C. Douglasii* break off as the plant matures, and this excellent specific character is commonly overlooked. *C. usta* is evidently allied to *C. leiorhyncha*, Meyer.

29.—CAREX DOUGLASII, Boott, var.? LAXIFLORA.

Taller and more slender than the species (18 inches high);

head browner and loose; spikes much fewer, large, spreading, relatively loosely flowered; perigynium rough on the angles above, broad; styles shorter. Near Utica, Montana, *R. S. Williams*, 1888. In this plant all the flowers and scales stand out distinctly and loosely, while in the species they are compacted into a nearly continuous mass.

30.—CAREX SPECIFICA.

C. scoparia, Schk., var. *fulva*, W. Boott, mostly, Bot. Cal. ii. 237 (1880) v. s. Hb. Gray.; Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 148 (1886).

Tall and stout (2 to 3 feet); culm broad, smooth, longer than the broad and short pointed leaves, much less stiff than in *C. Liddoni*; spikes densely aggregated into a large ovoid or oblong head (1½ inches or less long), or rarely the lower ones distinct, subtended by broad but inconspicuous short and scale-like bracts, fulvous and dull in color; perigynium long-ovate, prominently nerved on both sides, margined, the edges rough, prolonged into a slender and minutely toothed beak, but half filled by the achenium; scales thin and brown, acute or muticous, a little shorter than the perigynium. (276a.) California, Silver Valley, head of Toulumne River, and Ebbett's Pass, *Brewer* 1969, 1774, 2020, 2079, Soda Springs, Nevada County, *M. E. Jones*, San Bernardino Mts., *Parish*. The greater size, broad culm and leaves, thick head, firmer perigynia, duller color, and other characters remove the species from *C. Liddoni*, its nearest relative. Var. *incerta* of the latter species, however, may belong to *C. specifica* rather than to *C. Liddoni*.

31.—CAREX STRAMINEA, Willd. in litt.* in Schk., Riedgr. 49, f. 34 (1801) v. s. Hb. Willd.

C. straminea, var. *minor*, Dewey, Sill. Journ. (I.) xi. 158 (1826).

C. festucacea, var. *tenera*, Carey, Gray's Man. 1st ed. 545 (1848).

C. tenera, Sartw. Exsicc. No. 45 (1848), v. s.; Olney, Exsicc. fasc. ii. No. 13 (1871), v. s.

C. straminea, var. *tenera*, Boott, Ill. 120, t. 384 (1862).

C. tenera, Dew., forma *erecta*, Olney, Exsicc. fasc. ii. No. 14 (1871), v. s.

*Willdenow should in like manner be cited as authority for *C. Norvegica*.

C. straminea—"a slender woods form"—Bailey, Herb. distrib. (1886).

Culm slender, often very thin, the leaves lax; head open and slender, from three-fourths inch to two inches long, mostly inclined or somewhat drooping, the axis often weak or zigzag; spikes small, often scattered (sometimes a half inch apart); perigynium small and comparatively narrow, often long-pointed. This weak plant is the *Carex straminea* originally described and figured by Schkuhr. In the second part of his Riedgraser, five years later, he figured the stout and stiff plant which commonly has been regarded as the type of the species. This plant is

Var. BREVIOR, Dewey, Sill. Journ. (I.) xi. 158 (1826).

C. festucacea, Willd. Sp. Pl. iv. 242 (1805), v. s.

C. straminea, Schk., Riedgr. Nachtr. 23 f. 174 (1806).

C. straminea, var. *Schkuhrii*, Gay, Ann. Sci. Nat. (II.) x. 363 (1838), v. s.

C. straminea, var. *festucacea*, Tuckm., Enum. Meth. 18 (1843); Boott, Ill., 1200, t. 386 (1862).

C. straminea typica, and vars. *Crawei* and *Meadii*, Boott, Ill. 121 tt. 387, 388, 389 (1862), v. s.

C. fœnea, var. *β* Boott, Ill. 118, t. 376 (1862).

C. fœnea, var? *ferruginea*, Gray, Man. 5th ed. 580 (1867).

C. straminea, vars. *hyalina* and *typica*, Gray l. c.

C. tenera, var. *suberecta*, Olney, Exsicc. fasc. ii. No. 16 (1871), v. s.

Culm stiff, longer than the erect and long-pointed stiff leaves; head usually short and erect; spikes three to eight, globose or ovoid, usually contiguous, large; perigynium broad. The old *C. festucacea*, Willd., although bearing a long and open head, belongs here rather than to the type on account of its stiff habit and large spikes.

Var. HYALINA, Boott, Ill. iii. p. iv. (1862).

C. hyalina, Boott, Journ. Boston Nat. Hist. Soc. v. 112 (1845), v. s. Hb. Boott.; Ill. t. 371, f. 2 (1862.)

NOTE.—*C. straminea*, var. *festucacea*, Gay, Ann. Sci. Nat. (II). x. 363 (1838), v. s. Hb. Kew., is founded upon two plants, *C. straminea* var. *mirabilis*, Tuckm., and *C. fœnea*, Willd. (*C. adusta* of authors.)

C. straminea, var. *intermedia*, Gay, l. c. v. s. Hb. Kew., is also mixed, part being *C. straminea*, var. *brevior*, Dewey, and part *C. silicea* Olney.

C. tetrastachys, Scheele, Linnæa, xxii. 374 (1849).

Very tall and slender (16 inches or more high); spikes much contracted below, medium in size; perigynium very thin, flat and scale-like, the wide nerved margin wrinkled or corrugated above, produced into a very long and slender beak which renders the spikes comose in appearance; scales small and inconspicuous. Florida, *Chapman*, westward to Texas.

Var. CUMULATA.

C. alata, Torr., var. *pulchra*, Olney, at least in part, Exsicc. fasc. ii. No. 23 (1871), v. s.

Culm very tall and stiff; spikes several to many (sometimes 25!) greenish, usually aggregated into a bunchy head, very densely flowered and squarely contracted at the base, short and pointed, spreading; perigynium appressed, the points therefore not conspicuous. Monroe Co., Penn., *Porter*, to New Brunswick, *Fowler*; also on the Saskatchewan Plains, *Macoun*. Most like the var. *alata*, Bailey. In its heavier forms it resembles *C. tribuloides*, Wahl.

Var. AUSTRALIS.

C. pinetorum, Liebm., Mex. Halv. 75 (1850), v. s. Hb. Liebm.

C. festiva, forma *humilis*, Bœckl. Engler's Bot. Jahr. i. 75 (1881), v. s. (Excl. syn. *C. propinqua*, Nees et Meyer.)

Low (3 to eight inches high), the culm more or less curved; head small, composed of about three small and distinct but contiguous ovate spikes; perigynium small, the margin narrow, nerveless or nearly so, greenish or very light-tawny. Real del Monte, Mexico, *Coulter* 1622 (type, Hb. Kew.); Orizaba, *Liebmann*. This is the nearest approach of *Carex straminea* to *C. festiva*. From the latter species it is certainly distinguished by its separate and ovate spikes, the characters of the perigynium, and general port. *C. propinqua*, Nees (v. s. Hb. Berol.) I have never seen from North America. I doubt if it belongs to *C. festiva*.

Carex straminea may be better understood by adopting the following arrangement:

A.—*Heads stramineous.*

Carex straminea, Willd.

Var. brevior, Dewey.

Var. hyalina, Boott.
Var. australis, Bailey.
Var. mirabilis, Tuckm. (Sometimes greenish).
Var. aperta, Boott.
Var. maxima, Bailey.
Var. invisa, W. Boott.

B.—*Heads usually greenish.*

Var. alata, Bailey.
Var. cumulata, Bailey.
Var. fœnea, Torr.
Var. mixta, Bailey.

This arrangement omits two of the catalogued varieties, as they appear to merit specific distinction:

32.—CAREX SILICEA, Olney, Proc. Amer. Acad. Arts and Sci. vii. 393 (1868), v. s; Exsicc. fasc. i. No. 13 (1871).

C. straminea, var. *moniliformis*, Tuckm. Enum. Meth. 17 (1843); Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 151 (1886).

The essential characters of this plant appear to be constant, and its strictly maritime habitat gives it an additional value.

33.—CAREX STRAMINIFORMIS.

C. straminea, var. *congesta*, Boott, v. s.; Olney, Proc. Amer. Acad. Arts and Sci. vii. 393 (1868); Exsicc. fasc. ii. No. 20 (1871), v. s.

Aside from the dense head, in which the individuality of the spikes is more or less lost, and various minor characters, this plant differs from *C. straminea* as follows: Root dense and tough; lower portion of the culm clothed with many loose and leafless dry sheaths; leaves more numerous, much broader, thick and coriaceous, apparently nearly evergreen; lowest spike subtended by a broad and short scale-like bract; perigynium nerveless or nearly so, conspicuously margined, light colored and much broader than the lance-ovate, brown and sharp-pointed scale. (282a). California, Oregon and Washington.

34.—CAREX ADUSTA, Boott, Hook. Fl. Bor.-Am. ii. 214 (1840); Ill. t. 379.

C. albolutescens, Schw., var. *glomerata*, Olney, Exsicc. fasc. v. No. 10 (1871), v. s.

C. adusta, var. *glomerata*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 149 (1886).

C. pinguis, Bailey, Bull. 3, Geol. and Nat. Hist. Surv. Minn. 22 (1887.)

Culm very stiff and stout (1½ to 3 ft. high), longer than the leaves; head dense and broad, strictly erect, of which at least the lowest spike is subtended by a short and very broad-based, nerved and pointed bract; spikes globose, never prominently narrowed below; perigynium short-ovate and very plump, nearly filled by the large achenium, nearly or quite marginless, the inner face flat or not conspicuously convex and nerveless or very nearly so, the outer face very lightly nerved. In dense tufts: Mt. Desert, Maine, *Greenleaf*, New Brunswick, *Fowler*, Crawford Co., Michigan, *Bailey*, N. Minnesota, *Bailey*, and northwestward. Rare in the United States.

Carex adusta and *C. fœnea*, Willd., are admirable illustrations of the confusion into which some of our Carices have fallen. Boott founded his *C. adusta* upon specimens from Cumberland House, British America, and afterwards confounded with it the plant of our Northeastern States which has passed for this species. In restoring Boott's name to its original signification, the *Carex adusta* of all botanies and floras must change its name, and here *C. fœnea* of Willdenow comes forward to add new perplexities:

35.—CAREX FŒNEA, Willd. Enum. Pl. Hort. Berol. 957 (1809), v. s. Hb. Willd. and Hb. Berol. (not authors).

C. argyrantha, Tuckm. in Herb. distr. (1859), v. s. Hb. Gray.; Boott. Ill. t. 382, f. 2.

C. adusta of authors in part.

C. albolutescens, Schw. var. *argyrantha*, Olney, Exsicc. fasc. i. No. 9 (1871).

C. adusta, var. *argyrantha*, Bailey, Carex Cat. (1884).

Culm slender and often weak, (1 to 2 ft. high); head long and weak, often nodding; spikes five to eight, small and silvery-green, much contracted below and alternately disposed; perigynium varying from ovate to long-ovate, thin, much longer than the small achenium, prominently rough-margined, strongly many-nerved on both sides; bracts entirely wanting or very in-

conspicuous. New England and Pennsylvania, and westward to Michigan and Minnesota.

The species, as I have drawn it, includes larger forms than those described either by Willdenow or Tuckerman. Willdenow's specimens, particularly, are weak and short-headed, but as they were from cultivated plants they cannot be regarded as wholly representative of the species. The specimens of *C. fœnea* in Willdenow's herbarium are immature, but the characters are evident. Moreover, among the specimens of *C. ovalis*, in Willdenow's collection, is a sheet of the same, the specimens being more developed. This sheet is evidently from the same plants as the original; in fact, in the general herbarium at Berlin this plant is again mixed with "*C. ovalis*," and as *C. ovalis* was cultivated in the gardens at that time (*vide* Enum. Pl. Hort. Berol.), it is apparent that the original *C. fœnea* was mixed with it in culture. It is evident, therefore, that the specimens lying with *C. ovalis*, both in Willdenow's herbarium and in the general collection, are duplicates of the type. These duplicates are important, for they are mostly mature, although they differ in no other respect from Willdenow's type specimens. The same plant is again in the general herbarium, from Link, ticketed "*C. fœnea*, H. B." ("Hort. Berol.").* When Dr. Gray examined the plants of Willdenow, *Carex adusta* had not been separated from *C. straminea*, and it is not strange that he did not fully comprehend the plant in question. The plant understood as *C. fœnea* by Torrey and by him referred to *C. straminea* (v. s. Hb. Torr.), is wholly distinct from the plant of Willdenow, and Torrey's *C. straminea* var. *fœnea* may, therefore, stand. Bœckeler appears to have been the first to separate the plant of Willdenow from that of Torrey. (Linnæa, xxxix. 117 (1875)), but he refers it to his fourth form of *C. straminea*.

Willdenow's specimens are ambiguous' but I cannot identify them with any other species. The thin and almost translucent perigynia are characteristic of the American plant.

*There is also a plant in the general herbarium, from Kunth, which is labelled *C. fœnea* and certified to by Wahlenberg, but it is evidently a scoparia-like form of *C. straminea*.

Var. PERPLEXA.

C. adusta, Boott, Ill. 119, mostly, tt. 380 and 382 in part (1862), v. s. Hb. Boott, and authors largely, except Boott in Hook. Fl. Bor.-Am.

C. albolutescens, Olney, Exsicc. fasc. i. No. 8 (1871), v. s. (not Schw).

C. albolutescens, var. *sparsiflora*, Olney, Exsicc. fasc. v. No. 11, (1871), v. s.

C. adusta, var. *sparsiflora*, Bailey, Carex Cat. (1884).

Mostly taller and stouter than the species, the spikes larger and less attenuated or even truncate below, more approximate or even aggregated, the head erect or nearly so and the lowest bract sometimes prominent. New England to Northern Minnesota.

36.—CAREX CRYPTOCARPA, Meyer, Mem. Acad. St. Petersb. i. 226 t. 14 (1831).

C. Scouleri, Torr. Monogr. 399 (1836), v. s. Hb. Torr.

C. filipendula, Drejer, var. *concolor*, Drejer, Rev. Crit. Car. Bor. 46 (1841), v. s. Hb. Havn., Fl. Dan. t. 2372.

C. Romanzoviana, Chamisso. Steud. Plant. Cyper. 216 (1855), v. s. Hb. Lenorm.

This puzzling species extends from Northern Europe, through Greenland, and probably entirely across boreal North America, into Eastern Asia. The plants described under *C. filipendula* by Drejer, have not heretofore been carefully collated with the forms of *C. cryptocarpa*. I propose with confidence the following disposition:

Var. PUMILA.

C. filipendula, Drejer, var. *variegata*, Drejer, l. c. v. s. Hb. Havn.; Fl. Dan. t. 2371 (fig. not characteristic).

Low (6 to 12 in. high); pistillate spikes commonly two, short (¾ in. or less), ovate or short-oblong; scales broad and muticous, but little longer than the much lighter colored perigynium. Norway, *Fries;* Iceland; near Victoria, B. C., *Macoun*, and Alaska, *Krause*.

Var. HÆMATOLEPIS.

C. hæmatolepis, Drejer, l. c. 44, v. s. Hb. Havn.

Drejer himself compared this plant with his *C. filipendula*, and his characters of separation, which the material now accumulated shows to be only of varietal value, may still be quoted:

"spikes sub-erect, lax-flowered, elongated, peduncles often shorter and stronger, scales shorter, culm rough." The scales are longer than the perigynium, but obtuse or muticous, and the spikes are usually darker colored than in the species. Greenland, and probably adjacent America.

37.—CAREX FLAVA, L. Sp. Pl. i. 975 (1753), v. s. Hb. Linn.

C. foliosa, Gaud. Agr. Helv. ii. 191 *teste* Koch.

C. uetliaca, Sut. Helv. ii. 251, *teste* Koch.

C. flava, forma *lepidocarpa* and *androgyna*, Olney, Exsicc. fasc. iii. Nos. 26 and 27 (1871), v. s.

As compared with its varieties, *C. flava* is distinguished by its sessile or nearly sessile staminate spike, the contiguous and sessile pistillate spikes, the large, long-beaked, and much reflexed perigynium, the broad and abruptly divaricate bract, the broad and flat leaves, and the conspicuous yellow color of the whole plant. Europe, North America.

The various forms of this perplexing species have been singularly misunderstood and confounded. This is particularly true of the var. *Œderi*, the name having been transferred in recent years to a plant very different from the one originally characterized. A prolonged and careful study of the species in many herbaria discloses the fact that the American forms differ from the European, and enables me to present, with considerable confidence, the following arrangement:

Var. ELATIOR, Schlecht. Fl. Berol. i. 477 (1823), v. s. Hb. Berol.

C. flava, Host, Gram. Austr. i. 48, t. 63, f. 4, v. t.

C. lepidocarpa, Tausch, Flora, 1834, 129.

C. Lipsiensis, Peterm. Fl. Lips. 58 (1838), v. s. Hb. Berol.

C. pyriformis, F. Schultz, Jahr. xv. 122, *teste* F. Schultz.

C. flava, var. *lepidocarpa*, Anderss. Cyp. Scand. 25 (1849), and many authors since.

C. Marssoni, Auerswald, Bot. Zeit. 1852, 409.

C. flava, var. *Marssoni*, Marsson, Fl. Neu-Vorp. 537 (1869).

Staminate spike long-peduncled, pistillate spikes scattered or remote and commonly not more than two and the lowest one usually peduncled, perigynium smaller, straight or but slightly

bent, bracts and leaves narrow, and the color dull green throughout, tall and slender, (1 to 2 ft.). Europe. In America, represented by

Var. RECTEROSTRATA, Bailey, Bot. Gaz. xiii. 84 (1888).

Staminate spike sessile or nearly so, pistillate spikes three to four, of which the two or three uppermost are sessile and contiguous or approximate, the lowest being somewhat remote and more or less peduncled, spikes looser-flowered then in var. *elatior*, perigynium shorter then in the species and straight or nearly so, bracts long and spreading, but narrow, the lowest sheathing, leaves narrow, whole plant green, tall. Vancouver Island, *Macoun.*

Var. ŒDERI, Liljeblad, Svensk. Fl. 1st. ed. (1792).

C. divisa, Œder, Fl. Dan. fasc. vii. 4, t. 371 (1768).

C. Œderi, Ehrh.* Calam. Exsicc. No. 79 (1790?); Willd. Mem. Acad. Roy. 1794, 44, t. 1, f. 2; Schkuhr, Riedgr. 67, t. Ff. 26 (1801).

C. patula, Host, Gram. Austr. i. 48, t. 64, f. 1 and *C. Œderi*, Host, l. c. 49, t. 65, f. 1. v. t.

C. Œderi, Eng. Bot. t. 1773 (1801), v. t.

C. flava, var. *flavescens*, Wahl. Act. Holm. xxiv. 150 (1803).

C. flava, var. Willd. Sp. Pl. iv. 269 (1805).

C. flava, *β*. Schkuhr, Riedgr. Nacht. 56 (1806).

C. flava, var. *lutescens*, Wahl. Fl. Lapp. 234 (1812), v. s. Hb. Wahl.

C. flava, var. *Œderi*, Schlecht. Fl. Berol. 477 (1823), and many authors since.

C. Œderi, vars. *ædocarpa*, *elatior* and *pygmæa* Anderss. Cyp. Scand. 25 (1849).

C. flava, forma *depressa*, F. Schultz, Herb. Norm. Exsicc. cent. x. No. 955 bis. v. s.

C. Eu-flava, var. *lepidocarpa*, Syme, Eng. Bot. ed. iii. x. 159, t. 1673 (1870), v. t.

C. flava, vars. *pumila* and *intermedia*, Coss. et Germ. Fl. Paris, Ed. i.

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*Ehrhart cites Retz as authority for the species, but Retz declares that his plant is not the plant of Ehrhart (Kongl. Vet. Acad. Handl. xiv. 314. Stockholm, 1793). See also Lilj. Svensk., and Schk. Riedgr.

C. flava, var. *patula*, Coss. et Germ. Fl. Paris, Ed. iii.

C. flava, var. *minor*, Towns. Journ. Bot. xix. 161, v. s.; Bailey, Bot. Gaz. xiii. 84 (1888).

Staminate spike usually short-stalked, or a very small pistillate spike at its base, pistillate spikes green, scattered, some of them often radical, the lower ones peduncled, all densely flowered, perigynium small, rounded below, beak shorter than the body, straight or nearly so, bracts comparatively broad and long, spreading, leaves broad for the size of the plant which is low (3 to 8 in.) and diffuse, and green in color. Europe, generally distributed, and Atco, New Jersey, *Martindale*, introduced. Often confounded with var. *elatior*. This is not the plant which commonly passes for var. *Œderi* (see var. *cyperoides*), but it is certainly the one so understood by the older botanists. I have not been able to find Ehrhart's specimens, but the figure of Œder's *C. divisa*, which is the starting-point of var. *Œderi* and which is regarded by the Danish botanists as this plant (teste Lange, Nomen. Fl. Dan. pp. 12 and 279 (1887)), is unequivocal, as is also Willdenow's excellent figure. (Mem. Acad. Roy. 1794). Schkuhr's figure is less characteristic, but is, nevertheless, clearly this plant. An excellent illustration of the transfer of the name to another plant is afforded by the English Botany. Its figure of *C. Œderi* in 1801, is the plant under discussion, but its figure so named in 1870 is var. *cyperoides*. Represented in America by

Var. GRAMINIS.

Staminate spike short and sessile, pistillate spikes green, two or three and contiguous, globular or short-oblong, sessile, perigynium long-pointed but straight or nearly so, the beak often rough, the bract leafy and usually divaricate, leaves comparatively broad, the plant low (4 to 10 in. high), erect, green. In grassy places, probably generally distributed in the Northeastern States. A dwarfed and green form of the species, and is probably common. Specimens from Scotland closely resemble this but several characters appear to separate them.

Var. CYPEROIDES, Marsson, Fl. Neu-Vorpommern, 537 (1869), v. s.

C. chrysites, Link, Hb. Berol. v. s.

C. Œderi, Syme, Eng. Bot. ed. iii. x. 157, t. 1674 (1870), v. t., and most European botanists.

Staminate spike very small and short, closely sessile, pistillate spikes short (usually a half inch or less long) or globular, narrow, closely sessile and agglomerate at the top of the culm (or rarely one remote or radical), perigynium very small and short-beaked (half or less the size of the foregoing varieties), straight or nearly so, yellow or golden in color when mature, the bracts long and mostly erect and involucre-like from the agglomerate position of the spikes (whence the appropriate varietal name), the leaves narrow and erect, plant low (3 to 8 in. high), and yellowish. Europe; from Portugal, *Link*, to England and Sweden, *Andersson*. In America, represented by

Var. VIRIDULA.

C. viridula, Michx. Fl. Bor.-Am. ii. 170 (1803), v. s. Hb. Michx.; Boott, Ill. t. 523 (1867); Olney, Exsicc. fasc. i., No. 27 (1871), v. s.

C. irregularis, Schw. An. Tab. (1823), *teste* Dewey.

C. Œderi, Schw. and Torr. Monogr. 334 (1825); Dewey, Sill. Journ. x. 38 (1826); Gray, Gram. and Cyp. Exsicc. ii. No. 166, (1834), v. s.; Sartw. Exsicc. No. 124 (1848), v. s., and all American authors.

Differs from the last, among other characters, by its greater height (often a foot or more high), larger and longer spikes, and much longer and usually stricter bracts, and usually the much duller color of the spikes. Newfoundland to Pennsylvania and westward to Montana, *Williams* and S. Utah, *Parry*. Usually appears distinct from the species, but its relationship to var. *cyperoides* is very close and that variety clearly belongs to *C. flava*.

38—CAREX LAXIFLORA, Lam. Dict. de Bot. iii. 392 (1789), v. s. Hb. Lam.

C. heterosperma, Wahl. Köngl. Acad. Handl. xxiv. 151, (1803), v. s.

C. anceps, Muhl.; Willd. Sp. Pl. iv. 278 (1805), v. s. Hb. Willd.; Schk. Riedgr. Nachtr. 66, f. 128, (1806), v. s. Hb. Schk.

C. nematostachya, Willd.; Schlecht. Linnæa, x. 264 (1836), v. s. Hb. Willd.

C. nematosperma, Kunth, Enum. Pl. ii. 456 (1837).

C. anceps, var. *angustifolia* Dew. Wood's Bot. 1845, 423.

C. gracilescens, Steud. Cyp. Plant. 226 (1856), v. s. Hb Steud.

C. laxiflora, vars. *intermedia* and *blanda gracillima*, Boott, Ill. 37, 38, t. 91 (1858).

Lamarck's specimens, both from Virginia and New York, although young, are unmistakably the plant which Boott made var. *intermedia*, and I therefore revise the species that this form may appear as the type. The specimens of *C. anceps*, both in the collection of Willdenow and Schkuhr, are mixed.

The type of *C. laxiflora* embraces slender plants, characterized by narrow leaves (usually less than ¼ in. in width), a peduncled or at least very conspicuous staminate spike, scattered pistillate spikes which are very loosely flowered and narrow (½ to 1½ in. long), and very blunt perigynia. Var. *striatula* is marked by broad leaves, a very short and inconspicuous sessile staminate spike, very short and thick pistillate spikes (rarely over ½ in. long), the upper ones being sessile about the staminate spike, and the lower exserted on very slender peduncles. Between these two plants are perplexing forms which bear some characters in common, and which may be designated as

Var. VARIANS.

C. laxiflora, var. *intermedia*, Bailey, Bull. 3, Minn. Nat. Hist. & Geol. Surv. 22 (1887), not Boott.

Leaves broad (¼ to ½ in. wide); staminate spike sessile or nearly so; pistillate spikes cylindrical (½ in. to 1 in. long), two or three of them contiguous to the staminate spike and sessile or nearly so, one or two remote and short peduncled; bracts leafy and prolonged. New Hampshire to New Jersey, Minnesota and Kansas.

Var MICHAUXII.

C. striatula, Michx. Fl. Bor.-Am. ii. 173 (1803) v. s. Hb. Michx.

C. ignota, Dewey; Sartw. Exsicc. No. 97 (1848), v. s. Sill; Journ. (II). viii. 348 (1849).

C. laxiflora, Boott. Ill. t. 89 (1858).

Usually rather tall and slender; leaves narrow for the species; staminate spike commonly long-peduncled; pistillate spikes scattered, the lowest slenderly peduncled, loosely flowered, short (an

inch or less long); perigynium long-pointed and but slightly curved, triquetrous, finely many nerved, much longer and broader than the acute or muticous very thin scale. Carolina and southward, and westward to Texas.

Var. DIVARICATA.

Differs from the type in its larger and more or less clavate and peduncled staminate spike, the long and large (an inch or more long) pistillate spikes, which are scattered, the lower ones being remote and very long-peduncled, and particularly by the very large and divaricate trigonous and long-pointed perigynium which is contracted into a stipe-like base half or more as long as the body. Plant tall; leaves rather narrow; bracts moderately broad, three to five inches long. Near Washington, D. C., *Vasey*.

The following names belong to *C. laxiflora*:

C. truncata, Bœckl. Flora, 1858, 649, v. s. Hb. Carey. and Hb. Kew. (Drummond's 423), = *C. laxiflora*.

The scales are white-hyaline, truncate and awned, but I find no other characters to separate this from ordinary forms of the species. The characters of the scales are variable in this plant. I have the same plant from Louisiana.

C. bulbosa, Bœckl. Flora, 1855, 597, v. s. Hb. Kew., is the var. *Michauxii*. The species was described upon an unnumbered specimen collected by Drummond. The specimen in Hb. Kew., although unnamed, answers so completely the description that I have no hesitation in taking it for a dulicate of Bœckeler's original; it is from Drummond. In his later writings, Bœckeler has not mentioned this species.

C. fusiformis, Chapm.; Dew. Sill. Journ. (II). vi. 244 (1848), v. s. Hb. Carey., is a large-spiked var. *styloflexa*, Boott.

C. Chapmanni, Steud. Cyp. Plant. 222 (1856), is founded upon Chapman's *C. fusiformis*, and therefore is var. *styloflexa*.

39—CAREX DEBILIS, Michx. Fl. Bor.-Am. ii. 172 (1803), v. s. Hb. Michx.

C. debilis, var. *y*, Boott, Ill. 92, t. 274 (1860).

C. debilis, var. *prolixa*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 105 (1886).

Michaux does not state in his Flora, where he obtained his

C. debilis. His specimens are labelled "Basse Carolina?" The sheet contains, aside from this species, specimens of *C. laxiflora* var. *striatula*, Carey and *C. prasina*, Wahl. His description was drawn from the species in question.

Var RUDGEI.

C. tenuis, Rudge, Linn. Trans. vii. 97 t. 9 (1804), v. s. Hb. Kens.

C. flexuosa, Muhl.; Willd. Sp. Pl. iv. 297 (1805); Schk. Riedgr. Nachtr. 74 f. 124 (1806).

C. debilis, authors; Boott, Ill. t. 272.

The common Northern form.

Var. STRICTIOR.

Usually taller, strict; leaves broader (about 2 lines wide) and firmer; spikes stiffer, simply spreading or even erect; perigynium mostly shorter, and the scale often nearly as long as the perigynium. White Mountains, *Faxon.*

40—CAREX STRIATA, Michx. Fl. Bor.-Am. ii. 174 (1803), v. s. Hb. Michx.; Boott, Ill. t. 151 (1858).

Michaux had the Southern form, with hairy perigynia. Carolina to Florida.

Var BREVIS.

C. striata, β, Boott, Ill. 57 (1858).

Bracts shorter; perigynium smooth and usually more abruptly beaked; scales less sharp. North Carolina to New Jersey.

41—CAREX TRICEPS, Michx. Fl. Bor.-Am. ii. 170 (1803), v. s. Hb. Michx.

C. viridula, Schw. and Torr. Monogr. 320 (1825) v. s. Hb. Schw.

C. Bolliana, Bœckl. Flora, 1878, 40, *teste* Bœckl. in litt.

Small and slender (6 to 12 in. high); leaves smooth or rarely sparsely hairy below; sheaths hairy or puberulent; spikes small (a half inch or less long), contiguous and sessile; perigynium narrowly ovate or cylindrical-obovate, ascending; pistillate scale white-hyaline, the midnerve extended into a short and often hispid awn; staminate scales white-hyaline and sharp. Carolina to Texas.

Var. SMITHII, Porter; Bailey, Bot. Gaz. xiii. 88 (1888).

C. Caroliniana, Schw. Ann. N. Y. Lyc. Nat. Hist. i. 67 (1824) v. s. Hb. Schw.

C. Smithii, Porter; Olney, Exsicc. fasc i. No. 28 (1871) v. s.

Usually taller, olive-green; leaves smooth throughout; sheaths hirsute or puberulent; spikes longer, more scattered, the lower one or two usually short-peduncled; perigynium globular or nearly so, somewhat turgid, divaricate; scales, both pistillate and staminate, more obtuse and browner. The squarrose and fat perigynia give the spikes a peculiarly dense aspect which at once distinguishes this plant. Pennsylvania and New Jersey to N. Carolina; Arkansas, *Hasse*.

Var HIRSUTA.

C. hirsuta, Willd. Sp. Pl. iv. 252 (1805); Schk. f. 172 (1806) v. s. Hb. Schk.

C. triceps, Boott, Ill. t. 128 (1858).

A stouter and taller plant, as a rule, than either the type or the previous variety, green; leaves conspicuously hirsute; spikes usually larger and scales longer and sharper. The common northern form.

42—CAREX MILIARIS, Michx. Fl. Bor.-Am. ii. 174 (1803), v. s. Hb. Michx; Boott, Ill. t. 200, f. 2 (1858); Olney, Exsicc. fasc. 1, No. 16 (1871), v. s.

C. saxatilis, L. var. *miliaris*, Bailey, Bot. Gaz. ix. 120 (1884).

This puzzling species has been poorly defined, largely because two or three different plants have been confounded. It was for this reason that I was led to refer it to *Carex saxatilis*, with which it has no immediate affinity. The material is yet scant, but three forms of the plant appear to be clearly defined, and a fourth one is referred here provisionally. Whatever future observers may decide as to the merits of the varieties I propose, the disposition suggested cannot fail to make the species better known.

Culm very slender but erect (12 to 18 in. high), smooth or slightly rough above on the angles; leaves narrow, often almost filiform, rough on the edges, mostly shorter than the culm; staminate spikes one or two, elevated an inch or more from the upper pistillate spike, very narrow, an inch or less long; pistillate spikes one to three, the upper one sessile and the lower very short-stalked, small (¾ in. or less long), the lowest subtended by a bract which usually exceeds it; perigynium very small, broadly

or round-ovate, or ovate-oblong, thin but firm in texture, bearing a nerve upon either angle but otherwise nerveless or sometimes bearing a few very faint nerves near the base, rounded into a very short and terete beak which is either entire or somewhat erose; pistillate scales brown, lance-ovate, ending in a sharp whitish tip which nearly or quite equals the perigynium. Richibucto and Lake Mistassin, Canada, *Michaux;* Island in the Saguenay, near Lake St. John, Lower Canada, *A. H. Smith;* Rothsay, New Brunswick, *Fowler;* Drury's Cove, St. John's, N. B. *Hb. Gray.;* Newfoundland, *La Pylaie* (*Hb. Gray.*); outlet of Moosehead Lake, Maine, *C. E. & A. H. Smith.*

Very young specimens from Kennebeckasis, N. B., coll. by Fowler and distributed by Olney (Exsicc. fasc. v. No. 18) as "form. *minor*," cannot be determined, but they do not appear to belong here. The specimens distributed under this number were mixed. (See var. *obtusa*).

Var. OBTUSA.

Culm mostly shorter and even more slender; pistillate spikes much smaller (from ⅓ in. long to smaller and globular), closely sessile; pistillate scale very obtuse, little, if any more than half the length of the perigynium. Marguerite River, Lower Canada, *A. H. Smith.* In my own collection, Olney's No. 18 of fasc. v, from Kennebeckasis, N. B., *Fowler*, contains one specimen of this variety. This is evidently an admixture from Smith's collection, as Olney had Smith's plants. In Herb. Gray. this admixture does not occur in Olney's set.

Var. MAJOR.

C. miliaris, var., Olney. Exsicc. v. No. 16 (1871), v. s.

Much stouter (often fully two feet high), the culm thick and very sharply angled; leaves stout and canaliculate or involute; staminate spikes short-stalked; pistillate spikes one to five, mostly short-oblong, but often cylindrical (varying from ⅓ in. to 1½ in. long), stout and very dark and dull brown, the lower one or two short-peduncled; scale varying from wholly obtuse to muticous. Jupiter River, Anticosti, 1883, *Macoun;* Ungava Bay, N. Labrador, 1884, *Turner*; Outlet of Moosehead Lake, *Porter.* This plant lacks entirely the slender and graceful habit of *C. miliaris*, but I can detect no other constant characters of separation.

Var. ? AUREA.

C. pulla, Gray, Man. 5th ed. 602 (1867), v. s.

C. pulla, var. (?) *miliaris*, Gray, l. c., v. s.

C. miliaris, var., Olney, Exsicc. fasc. v. No. 17 (1871), v. s. and No. 18, probably.

Taller and mostly stouter than the species; staminate spikes two to three, mostly long-peduncled; pistillate spikes one or two, the upper sessile, the lower short-peduncled, often staminate at the apex, yellow or stramineous; perigynium thin and yellow as in *C. monile*, mostly prominently few-nerved, gradually produced into a conspicuous and more or less toothed beak, broader and usually longer than the light brown or whitish muticous scale. Kennebeckasis, N. B., *Fowler;* Outlet of Moosehead Lake, Maine, *C. E. & A. H. Smith.* This plant, in the color of its spikes and characters of its perigynia, at once suggests *C. monile*, with which future study may unite it. So far as can be determined from the poor material at hand, it lacks entirely the peculiar texture of the small and abruptly short-beaked perigynia of *C. miliaris.*

A plant collected at the outlet of Moosehead Lake by C. E. Smith, and referred doubtfully to *C. rotundata*, Wahl. in the Manual, I am unable to place, although it may be an outlying form of this poorly defined variety. The beak is exceedingly short and perfectly entire.

43—CAREX PHYSOCARPA, Presl. Reliq. Hænk. i. 205 (1830), v. s. Hb. Presl.; Boott Ill. t. 513 (1867), v. s. Hb. Boott; Bailey. Proc. Amer. Acad. Arts and Sci. xxii. 65 (1886).

C. ochroleuca, Chamisso ;Steud. Plant. Cyper. 216 (1855), v. s. Hb. Lenorm.

Distinguished by its rough-peduncled and comparatively short (an inch or two) brown spikes, its very broad and obtuse scale, and the short and nerveless, short and entire-beaked perigynium, which exceeds the scale. Nootka Sound, *Hœnke;* Rocky Mts. of British America, *Drummond, Macoun;* Alaska, *Chamisso.* This is a puzzling species. Macoun's specimens, collected at Morley, have scales more inclined to be acute than do other specimens, but I have no hesitation in referring them to this species.

44—CAREX SAXATILIS, Linn. Fl. Lapp. 259.

C. pulla, Gooden. Linn. Trans. iii. 78 (1797), v. s. Hb. Kew.

I am entirely unable to draw close lines of separation between

the various forms of *C. saxatilis*, *C. vesicaria* and *C. monile*; and no doubt C. *physocarpa* will be found to add confusion to the group. After much study in many places, the arrangement of C. *saxatilis* proposed in my Synopsis still seems the best for our present purpose. The characters of C. *saxatilis* may be drawn as as follows:

A low plant (4 to 8 in. high), the culm often curved, with one staminate spike, and one or two short (seldom over a half inch long and usually shorter) and dark purple pistillate spikes which are either sessile or short-peduncled; perigynium nearly orbicular, very short and entire-beaked and nerveless. Scotland and Northern Europe, Greenland and Behring Straits and James Bay, *J. M. Macoun*. Its nearest ally is *C. compacta*, which differs at once as follows: Culm very strict and stout and conspicuously longer than the usually broader leaves, a foot or more high; staminate spikes often two; pistillate spikes longer and evenly cylindrical, very compact; lower bract conspicuously spreading.

Var GRAHAMI, Hooker & Arnott, Brit. Fl. 8th ed. 510.

C. Grahami, Boott, Linn. Trans. xix. 215 (1843), v. s. Hb. Boott.

C. saxatilis, var. *major*, Olney, Bot. King's Rep. v. 370 (1871).

Larger; staminate spikes often two; pistillate spikes two to three, heavier and longer, the lowest usually long-peduncled; perigynium less purple or even entirely yellow, much more slender and longer beaked, nerved; scales sharper. Scotland; high mountains of Colorado, Utah, and northward. It is possible that future observers may be able to detect varietal differences between the plants of Scotland and America. The larger forms of the American plant differ considerably from the Scottish, but there are all possible gradations between them. Var. *Grahami* runs close to forms of *C. monile*, from which it is distinguished by its short and entire beak, much less prominently nerved perigynium, more obtuse scales, and smaller size.

The following matters of synonymy may be corrected in this connection:

C. hymenocarpa, Drejer, Revis. Crit. Car. Bor. 58 (1841), v. s. Hb. Havn., is not *C. compacta*, R. Br., but a boreal form of *C. rostrata*, Stokes. (*C. rostrata* var. *hymenocarpa*,

Christ, Comptes-Rend. Soc. Roy. Bot. xxiv. part 2, 11 (1885),).

C. vesicaria, var. *alpigena*, Fries, Mant. ii. 142, v. s., is not to be referred to *C. saxatilis*. It is highly probable that both this and *C. hymenocarpa* are forms of *C. rostrata*, Stokes, as Lange maintains.

C. vesicaria, var. *dichroa*, Anderss. Cyp. Scand. 18 (1849), is evidently also a form of *C. rostrata*.

C. ampullacea, var. *borealis*, Lange, Fl. Grœn. ii. 118, v. s. Hb. Havn., is not *C. compacta*, but is perhaps inseparable from the preceding plants.

The removal of these names from *C. compacta* (*C. membranacea*, Hook. is *C. compacta*, v. s. Hb. Kew.) removes the species from Greenland and renders its characters distinct. At the same time, a study of good material indicates that *C. rotundata*, Wahl. (v. s. Hb. Wahl), occurs in America only in Greenland. It is merely a reduced form of *C. rostrata*, Stokes, and need never be confounded with *C. compacta*.

45.—CAREX MONILE, Tuckm., is distinguished from all the preceding species by its long and slim spikes which are yellow, its turgid, large, strongly nerved perigynium, which is produced into a long and sharply toothed beak, its narrow and sharp scales, and greater size. The var. *obtusisquamis*, Bailey, is anomalous, and its position is provisional.

Var. RAEANA.

C. Raeana, Boott, Rich. Arc. Exped. ii. 344 (1851), v. s. Hb. Boott; Ill. 25, t. 64 (1858).

Distinguished by its smaller size, much shorter (1½ in. or less long) and thinner spikes, and particularly by the very narrow and involute leaves. Methye Portage, British America, *Richardson*.

Var. COLORATA.

Smaller; spikes shorter than in the species, dark brown; perigynium very much less turgid and shorter beaked; scales shorter and not so sharp. Colorado: Grand Lake, *Vasey*, 5,849; Leadville, *Trelease*. I have not the specimens referred to *C. monile* by Wm. Boott in Bot. Cal. ii. 251 (*Bolander* 6,211), but I suspect that they belong to this variety. Transition to *C. saxatilis* var. *Grahami*.

Var. MONSTROSA.

Terminal spike more or less pistillate; pistillate spikes reduced to one or two, very small and loosely flowered, and usually on very long and filiform peduncles; whole plant very slender. —Concord River, E. Massachusetts, *Swan*, growing with *C. oligosperma*, Michx.

46.—CAREX AMBUSTA, Boott, Ill. 64, t. 172 (1858), v. s. Hb. Boott; Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 88 (1886).

C. salina, var. *ambusta*, Bailey, Carex Cat. (1884).

This is a good species, to be separated from *C. saxatilis*, its nearest ally, by the characters which have been already pointed out: Perigynium nearly lanceolate, gradually long-pointed and spreading, possessing none of that shiny, papery and inflated appearance so characteristic of most of the Vesicariæ; scales much longer and acute or muticous; lower spike on a short but slender peduncle. Ungava Bay, Labrador, *Turner;* British Columbia, *Rothrock*, to Alaska.

47.—CAREX VARIA, Muhl. in Wahl. Kongl. Acad. Handl. xxiv. 159 (1803); Willd. Sp. Pl. iv. 259 (1805), v. s. Hb. Willd.; Schkuhr. Riedgr. Nachtr. 48, f. 167 (1806), v. s. Hb. Schk.

C. alpestris, Dewey, Sill. Journ. (I.) vii. 268 (1824).

C. Davisii, Dewey, l. c. x. 279 (1826).

C. albicans, Willd. in Herb.; Spreng. Syst. Veg. iii. 818 (1826); Schlecht. Linnæa, x. 264 (1836), v. s. Hb. Willd.

C. Emmonsii, Dewey; Torr. Monogr. 411 (1836); Sartw. Exsicc. No. 105 (1848), v. s.; Boott, Ill. 97, t. 286 (1860).

C. Novæ-Angliæ, var. *Emmonsii*, Carey, Gray's Man. 1848, 556.

C. lucorum, var. *Emmonsii*, Chapm. Flora S. States, 539 (1860).

C. Emmonsii, var. *elliptica*, Boott, Ill. 97, t. 287 (1860).

It is singular that modern botanists have overlooked the fact that Schkuhr's figure of *Carex varia* is the *C. Emmonsii* of Dewey. This species was sent to Europe by Muhlenberg under a MS. name, and the specimens were divided among Wahlenberg, Willdenow and Schkuhr. These specimens are unmistakably the plant defined by Dewey as *Carex Emmonsii*.

Var. COLORATA.

Scales conspicuously purple-margined, giving the head a dark appearance.—Chiefly southward, evidently, and not common. In a species which is characterized by green heads, such a variation appears to be worth a varietal name.

The *C. varia* of all later botanists may be called

48.—CAREX COMMUNIS.

C. varia, Dewey, Sill. Journ. 1st ser. 152 (1826); Sartw. Exsicc. No. 108 (1848), v. s.; Boott, Ill. 97, t. 288 (1860), and all authors since Muhlenberg.

C. varia, var. *pedicillata*, Dewey, l. c. 163, (1826); Sartw. l. c. No. 109, v. s.

C. Pennsylvanica, Gray, Gram. and Cyp. Exsicc. ii. No. 162 (1834), v. s.; Torr. Monogr. 410 (1836).

C. Pennsylvanica, var. *Muhlenbergii*, Gray, l. c. No. 163, v. s.

C. varia, var. *minor*, Boott, Ill. 97, t. 389 (1860).

Canada to Georgia.

Var. WHEELERI.

Mostly lower than the species; leaves very numerous, very broad and bright green, conspicuously shorter than the culm; staminate spike very short (usually only a fourth or third inch long), closely sessile, inclined and inconspicuous; lowest bract leaf-like, often an inch or two long. Knolls in woods: Cheshire Co., N. Hampshire, *Bailey;* Ionia Co., Michigan, *Wheeler*, and Alcona Co., *Bailey*. In aspect much like *C. varia* (*C. Emmonsii*), but is at once distinguished by the broad leaves and large perigynia.

C. collecta, Dewey, referred to this species by Boott, is *C. Novæ-Angliæ*, Schw.

C. turbinata, Liebm. Mex. Halv. 77 (1850), v. s. Hb. Liebm., referred to this species by Bœckeler (Engler's Bot. Jahrb. i. 364), is a good species, distinguished, among other things, by its strongly many-ribbed perigynia. Future observers may find that my *C. rigens* is a large, stiff, and more developed form of *C. turbinata*. (See No. 94).

49.—CAREX DEFLEXA, Hornemann, Plantelære, Ed. 3, i. 938 (1821); v. s. spec. authent. Hb. Gray.

C. varia, var. *minor*, Boott, Hook. Fl. Bor.-Am. ii. 223 (1840), in part.

C. pilulifera, var. *deflexa*, Drej. Rev. Crit. Car. Bor. 54 (1841).

C. Novæ-Angliæ, authors in part.

Very low, much tufted; culms from 1 to 6 inches long, setaceous, more or less curved or spreading, little exceeding or shorter than the narrow leaves; staminate spike exceedingly minute and nearly always invisible in the head; pistillate spikes two or three, two to five flowered, green or green-and-brown, all aggregated into a little head, the lowest one always more or less short-peduncled and subtended by a leafy bract a half inch or less long; radical spikes very few or none; perigynium very small, much contracted below, sparsely hairy or nearly smooth, the flat beak exceedingly short. Rocks and woods, Greenland, southward to the high mountains of New Hampshire and Vermont, and westward to Alaska, and E. Oregon, *Cusick*, and the Wenatchie region of Washington, *Brandegee*, 1145. A neat little alpine Carex. Its particular distinguishing marks are the lower leafy bract and the peduncled lowest spike, although this peduncle is often so short as to be concealed by the bract. Excellent characters are also found in the staminate spike and in the disposition of the pistillate spikes. It is the boreal representative of *C. varia*, Muhl. (*C. Emmonsii*, Dew). Like most alpine species, it runs into many forms in intermediate localities, but the material is now sufficient to warrant the following positive disposition:

Var. DEANEI.

C. varia, var. *minor*, Boott, Hook. Fl. Bor.-Am. ii. 223 (1840), in part.

C. Novæ-Angliæ, authors, in part; Boott, Ill. t. 285 (1860).

Taller and laxer, the culms from 6 to 12 inches high and some or all prominently exceeding the long and loose soft leaves; staminate spike much larger (2 to 3 lines long), erect or oblique, strictly sessile; pistillate spikes larger (four- to eight-flowered), less aggregated or the lowest usually separated, though rarely more than ¼ inch removed; radical spikes usually numerous; bract mostly longer. Swales or dryish places, subalpine regions of New Hampshire, Vermont, New York, and northward, and Mt. Desert, Me. In aspect like *C. varia*, Muhl. (*C. Emmonsii*, Dew). Named for Walter Deane, of Cambridge, Mass., an ardent student of the New England flora.

Var. MEDIA.

C. Novæ-Angliæ, var. *deflexa*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 124 (1886).

Rather stiff, 4 to 12 inches high, in dense tufts; most of the culms somewhat exceeding the leaves; staminate spike prominent and erect, 3 to 5 lines long, sessile or very short-peduncled; pistillate spikes two or three, all scattered, the uppermost at or near the base of the staminate spike, the lowest usually very prominently peduncled and subtended by a conspicuous bract which surpasses the culm, all rather compactly three- to eight-flowered, green or brown-and-green; radical spikes usually abundant; perigynium much as in short-beaked forms of *C. umbellata*; scales large and sharp, equalling or exceeding the perigynium. Mountains, Montana and Colorado to Oregon. In aspect much like tall forms of *C. umbellata*, Schk.

Var. ROSSII.

C. Rossii, Boott, Hook. Fl. Bor.-Am. ii. 222 (1840).

C. Novæ-Angliæ, var. *Rossii*, Bailey, Bot. Gaz. x. 207 (1885).

Stiff throughout, very strict, the leaves mostly equalling or exceeding the culms, the whole plant usually light colored; staminate spike much as in the last, often larger; pistillate spikes one to three, distinct or sometimes scattered, loosely one- to four-flowered; radical spikes usually abundant; scales very sharp, greenish-white or very rarely bearing an inconspicuous colored margin. Mountains, Colorado to British Columbia.

Var. BOOTTII.

C. brevipes, W. Boott, Bot. Calif. ii. 246 (1880), in part at least.

C. globosa, var. *brevipes*, W. Boott, l. c. 485.

Low and more or less diffuse (6 inches or less in height), some at least of the culms somewhat exceeding the leaves, which are broader and flatter than in any other form of the species; staminate spike short and sessile or nearly so; pistillate spikes one or two, contiguous, large and compact (four- to twelve-flowered), the lowest subtended by a very broad bract which mostly much surpasses the culm; radical spikes abundant; scales broadly purple-margined. Mountains, California.

50.—CAREX NOVÆ-ANGLIÆ, Schw. Ann. N. Y. Lyc. Nat. Hist. 1. 67 (1824), v. s. Hb. Schw.; Dewey, Sill. Journ. (I.) ix. 64, t. 2, f. 7 (1825); Schw. & Torr. Monogr. 328 (1825).

C. collecta, Dewey, Sill. Journ. (I.) xi. 314, f. 44 (1826), v. s. Hb. Gray. and Hb. Schw., and *teste* Torr. Monogr. 411, and Dewey, Cat. Pl. Mass. 266.

Very slender, stoloniferous, the culms 6 to 8 inches high, about the length of the very narrow and loose leaves; staminate spike always distinct, erect and prominent, 3 to 8 lines long, mostly minutely peduncled, exceedingly narrow (about ½ inch broad); pistillate spikes usually two, the upper near the base of the staminate spike, the lower from ½ to 1 inch removed and short stalked and subtended by a bract which nearly or quite equals the culm, both rather loosely three to six-flowered; radical spikes none; perigynium very narrow, often nearly oblanceolate, very thinly hairy, the sharp beak prominent; stigmas often two. W. Massachusetts: Saddle Mountain, 3,000 feet altitude (the original locality), "small bogs on the border of a high sphagnous marsh, Worthington, Mass., with *C. curta*," *Dewey*; Mt. Desert, Me., *Rand;* St. John's, New Brunswick, *Fowler;* "In grassy woods," Prince Edward Island, *Macoun.* Very rare. In aspect much like depauperate forms of *C. Pennsylvanica.*

51.—CAREX BARBARÆ, Dewey, Bot. Mex. Bound. Surv. 231 (1859), v. s. Hb. Olney.; Sill. Journ. (II). xxxi. 24 (1861).

C. Schottii, Dewey, l. c. v. s. Hb. Olney., evidently.

C. aquatilis, W. Boott, Bot. Cal. ii. 241 (1880), v. s. Hb. Gray.

Sufficient material has now accumulated to allow of a positive characterization of this species: Tall and leafy, glaucous; culm sharply angled and rough, particularly above; pistillate spikes two to four, long and narrow (1 to 3 in. long), the upper one or two sessile or short peduncled and often staminate at the apex, the lower very long and slenderly peduncled (peduncle 3 to 4 in. long), very much attenuated at the base, usually truncate at the top; bracts leaf-like, the lowest one or two much prolonged; perigynium small, obovate or ovate, nerveless, abruptly contracted into a short and small, but very distinct beak, either

shorter or longer than the white-backed and brown-edged obtuse or muticous scale. California; Santa Barbara, *Parry*, Los Angeles, *Wood*, San Jose, *Bolander*. Oregon; *Wilkes* 308, Mt. Hood, *Howell*, Lost Lake, *Henderson* 1,689. Washington; Skamania County, *Suksdorf* 107. Vancouver Island, *Lyall*, *Macoun* 25, (1887). This species is closely allied to *C. aquatilis*, Wahl., and it should stand next that species (72 *a*). The place now occupied by *C. Barbaræ* in my Synopsis (No. 86), should be filled by

52.—CAREX HOWELLII.

Tall and stout (3 to 6 ft. high); culm very sharply angled, rough above; leaves broad and lax and very long, the sheaths covering the base of the culm with a long and papery brown envelope; staminate spikes two to three, heavy, prominently peduncled; pistillate spikes about four, very long (2 to 4 inches), cernuous or somewhat bent, the upper two on peduncles a half inch or inch long, and usually staminate above, the lowest very long peduncled (peduncle sometimes six inches long); perigynium narrowly elliptic or elliptic-oblong, obscurely few-nerved, conspicuously granulated when mature, produced into a slender and entire beak, shorter than the lance-linear, muticous, dull brown scale.—Oregon: swamps at the mouth of the Columbia, *Howell*. The gross habit, aside from more particular characters, separate this at once from *C. Barbaræ*.

53.—CAREX MACOUNII, A. Bennett; Macoun, Cat. Can. Pl. iv. 147 (1888), v. s.

C. salina, var.? *robusta*, Bailey, Bot. Gaz. xiii. 87 (1888).

I proposed this plant as a variety of *Carex salina* from the impression that it might prove to be a hybrid, inasmuch as the perigynia in the specimens are empty, and the plant appears to be variable. It is evident, however, that *Carex salina* does not occur on the western side of the continent, and that the plant in question is a good species.

54.—CAREX SALINA, Wahl. Köngl. Acad. Handl. xxiv. 165 (1803), v. s. Hb. Wahl.

C. salina, var. *mutica*, Wahl. Fl. Lapp. 246 (1812), v. s. Hb. Wahl.; Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 88 (1886).

C. lanceata, Dewey, Sill. Journ. (I.) xxix. 249 (1836).

C. salina, var. *minor*, Boott, in part, Ill. 160, tt. 527 and 528 (1867).

Cumberland House, British America, to Greenland. N. Europe.

Var. CUSPIDATA, Wahl. Fl. Lapp. 246 (1812).

C. cuspidata, Wahl. Kongl. Acad. Handl. xxiv. 164 (1803), v. s. Hb. Wahl.

C. stricta, Hook. and Arn. Bot. Beechey's Voy. 131 (1834).

C. recta, Boott, Hook. Fl. Bor.-Am. ii. 220. t. 222 (1840).

Hudson's Bay to Massachusetts. Europe.

In proposing this arrangement of the synonymy of *Carex salina*, Wahlenberg's original application of the name is adopted. He described at the same time (1803) *C. salina* and *C. cuspidata*; afterwards (1812) he united them into a composite species, making them varieties of a *C. salina* for which he designated no typical form, a practice still common among European botanists in the treatment of variable species. When later botanists insisted upon separating one of the varieties to represent the type of *Carex salina*, the var. *cuspidata* was chosen, leaving the plant which had been originally proposed as *C. salina* to rank as a variety.

55.—CAREX TOLMIEI, Boott. Hook. Fl. Bor.-Am. ii. 124 (1840), v. s. Hb. Boott.; Ill. 100 t. 299 (1860.)

C. vulgaris, var. *alpina*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 81 (1886), mostly.

This ambiguous species appears to include a great number of forms, and to represent *Carex vulgaris* on the western side of our continent. The true var. *alpina*, Boott (*C. rigida*, Good.) is a short and stiff plant with narrow leaves, broad perigynia and short, obtuse scales; it occurs in our high latitudes, ranging from Greenland to Behring Straits, and evidently extending as far south as Cumberland House. The plants of the western mountains of the United States, formerly referred to this variety, may be to associated for the present with *C. Tolmiei*.

Plant rather stout, from a dense and woody root (1 to 2 feet high); leaves very broad for the group, deep green, conspicuously pointed, shorter than the culm; staminate spike usually one, mostly short-peduncled; pistillate spikes two to four, somewhat contiguous or partially scattered, oval or oblong (½ to 1½ inches

long), the two lowest usually on slender peduncles an inch or two long, the others sessile or nearly so; lowest bract leaf-like and equalling or exceeding the culm; perigynium compressed-trigonous, ovate or round-ovate in outline, pale and more or less discolored or even covered with purple dots (or rarely almost yellow), produced into a very short and entire beak, mostly shorter than the obtuse or muticous purple scale; stigmas two or three. Mountains of Oregon and Washington to Montana.

Var. NIGELLA.

C. nigella, Boott, Hook. H. Bor.-Am. ii. 225 (1840), v. s. Hb. Boott.; Ill. 194 (1867).

Perigynium minutely bidentate; scale narrower and sharper. Columbia River, *Tolmie;* Mt. Hood, *Henderson.*

Var. SUBSESSILIS.

Spikes short and thick (from round oblong to an inch long), very densely flowered, the staminate sessile, the pistillate aggregated near the top of the culm, sessile, or the lowest very short peduncled; perigynium broader and more abruptly contracted. E. Oregon, *Cusick* 1,178 and 1,180; Gray's Peak, Colorado, *Patterson.*

Var. ANGUSTA.

Taller; leaves very long and narrow, the basal sheaths becoming fibrillose; spikes all sessile, or the lowest peduncled, cylindrical; bracts narrow, or filiform. Kerbyville, Oregon, *Howell.* Probably a distinct species.

56.—CAREX LAXICULMIS, Schweinitz, Ann. N. Y. Lyc. Nat. Hist. i. 70 (1824), v. s. Hb. Schw.

C. retrocurva, Dewey, Wood's Bot. 1845, 423.

Canada to Carolina. Distinguished by its glaucousness.

Var. FLORIDANA.

Lower (6 to 10 inches high), the leaves but one-third or one-fourth the width of those in the type; upper spike contiguous to the staminate spike, and sessile or short peduncled. Florida, *Chapman, Curtiss.*

57.—CAREX DIGITALIS, Willd., var. COPULATA.

C. retrocurva, var. *copulata*, Bailey, Herb. Distr. 1886.

Larger than the species, the culms weak and reclining, sometimes two feet long; leaves twice or thrice broader; spikes

shorter and heavier; perigynium mostly larger.—Woods, central Michigan, where it is common. In aspect much like *C. laxiculmis*, but has no glaucousness, the upper spikes are shorter peduncled, and minor characters also separate them. I find it to be connected with *C. digitalis* by intermediate forms.

58.—CAREX PTYCHOCARPA, Steudel, Pl. Cyper. 234 (1855), v. s. Hb. Boott. (Drummond, 424); Bœckl. Linnæa, xli. 147 (1877); Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 116 (1886).

Low, the culm two to five inches high, and a half or less shorter than the glaucous leaves, which are ¼ inch or less wide; staminate spike small and sessile and usuually overtopped by the upper pistillate spike; pistillate spikes lax-flowered, the upper sessile, and only the lowest long-peduncled; bracts leafy, broad and elongated. Purgatory Swamp, near Boston, *Faxon, Morong;* New Jersey, *Britton;* Delaware, *Canby;* Florida, *Chapman, Curtiss;* New Orleans, *Drummond*.

Var. MACROPHYLLA.

C. digitalis, var. *glauca*, Chapm. Flora, S. States, 541 (1860), v. s. Hb. Torr.

Leaves very broad (⅓ in. or more), two to three times longer than the culm (1 to 1½ ft. long), prominently many-nerved and very glaucous. Florida, *Chapman*. A singular plant.

59.—CAREX JAMESII, Schweinitz, Ann. N. Y. Lyc. Nat. Hist. i. 67 (1824), v. s. Hb. Schw.

C. Steudelii, Kunth, Enum. Pl. ii. 480 (1837), v. s. Hb. Berol.

When Schweinitz proposed this species, *C. Steudelii* had not been separated from *C. Willdenovii*, and Schweinitz and Torrey a year later referred this species to *C. Willdenovii*. Torrey's *C. Jamesii* must now take another name:

60.—CAREX NEBRASKENSIS, Dewey, Sill. Journ. (II.), xviii. 102 (1854), v. s. Hb. Torr.

C. Jamesii, var. *Nebraskensis*, Bailey, Carex Cat. Suppl. (1884).

Var. PRÆVIA.

C. Jamesii, Torr. Mongr. 398 (1836).

Distinguished from the species chiefly by its longer and sharper scales and more ascending pergynia.

61.—CAREX CRINITA, Lam., var. MINOR, Boott, Ill. 18 (1858).

C. crinita, var., Sartw. Exsicc. No. 78 (1848), v. s.

Much smaller than the type (2 ft. or less high), the leaves half narrower; spikes small and short (1 ¼ in. or less long); scale shorter and smoother. Penn Yan. N. Y., *Sartwell;* Mt. Desert, Me., *Redfield.* Has somewhat the aspect of *C. prasina*, Wahl.

62.—CAREX VICARIA.

C. glomerata, Bœckel. in part, Linnæa, xxxix. 59 (1875); W. Boott, Bot. Cal. ii. 232 (1880), v. s. Hb. Gray.

C. Brongniartii, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 137 (1886).

The Pacific slope representative of *C. vulpinoidea*, Michx.: Spikes looser-flowered than in that species, the perigynium much larger and more spreading, somewhat stipitate, nerveless, or bearing indistinct short nerves on the inner face, striated with brown nerves on the back, the bracts wanting except the one or two lower ones, which are setaceous and somewhat prolonged (½ to 1 ½ in. long). Oregon and California. I have examined the original of *C. Brongniartii*, Kunth (v. s. Hb. Berol.) and find that it is distinguished from the North American plant by several characters, particularly by the much broader perigynium which is prominently nerved inside. In fact, *C. Brongniartii* is closely alllied to *C. Muhlenbergii*, Schk. Other plants, variously named, from various parts of South America, approach more nearly our plant, but it is impossible definitely to refer our species to any South American species; and I am confident that future observation will discover other permanent characters of separation, inasmuch as such has been the case in nearly every instance in which Carices of the two countries, which were supposed to be identical, have been carefully studied.

Var. COSTATA.

Perigynium very strongly many-nerved or ribbed on the outer face, and usually bearing three or four nerves on the inner face. Grant's Pass, Oregon, *Henderson*, 1477.

63.—CAREX DENSA.

C. Brongniartii, Boott, t. 402 (1862).

C. paniculata, W. Boott, Bot. Cal. ii. 232 (1880), v. s. Hb. Gray.

C. Brongniartii, var. *densa*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 137 (1886).

Head very dense, ovoid or nearly globose in general outline, dull dark brown; lowest bract often conspicuous, setaceous, an inch or so long; perigynium broad-lanceolate, twice longer than in the last species, thick, very strongly nerved on both sides, wingless or slightly rough-margined above, produced into a long, cylindrical cleft beak; scales muticous or short-acute. California: *Palmer*, *Bigelow*, *Brewer*, *Kellogg* and *Harford* 1067.

C. Xalapensis, Kunth, referred here in my Synopsis, is *C. Muhlenbergii*, Schk. var. *enervis*, Boott (v. s. Hb. Berol.).

C. glomerata, Thunb., a South African species, is separated from both *C. densa* and *C. vicaria* by several characters, chiefly by the broader and flatter perigynium which is less nerved, conspicuously margined, laciniate on the edges above, and shining at maturity.

64.—CAREX ALMA.

Allied to *C. vulpinoidea*, Michx. and *C. vicaria*, Bailey: Culm short and stiff (a foot to foot and a half high), sharply angled, roughish, often curved; leaves very stiff, canaliculate, rather broad, longer than the culm, glaucous; spikes mostly compound, very numerous and composing a head three to four inches long, the lower ones sometimes remote, but mostly densely aggregated, dull brown; bracts broad, with thin white margins, produced into an awn which does not equal the spike; perigynium ovate, small and thin, margined, nerveless or nearly so, very rough on the margins above, the beak bifid; scales broadly ovate, prominently white-margined, acute (242*a*). San Bernardino Co., California, *Parry* and *Lemmon* 396 (Hb. Bailey., and Hb. Phila. Acad. Sci.). In aspect much like *C. leiorhyncha*, Meyer, but distinguished at once by the absence of the setaceous bracts and by the rough-angled perigynium. It is probable that all the plants referred to *C. leiorhyncha* in this country belong to this species.

65.—CAREX TRIANGULARIS, Bœckl. Flora, 1856, 226; Linnæa, xxxix. 96 (1875).

C. vulpinoidea, var., Boott, Ill. t. 409, f. 2 (1862).

C. vulpinoidea, var. *platycarpa*, Olney, Hall's Pl. Tex. 25 (1873), v. s.; Bailey, Coulter's Man. 392 (1885).

C. vulpinoidea, var. *Drummondiana*, Bœckl. Linnæa, xxxix. 96 (1875), v. s. Hb. Berol.

More slender than *C. vulpinoidea*, but strict; spikes fewer, strictly simple, more or less scattered, green or light brown, truncate at the top; bracts few and usually inconspicuous or wanting above the lowest; perigynium larger than in *C. vulpinoidea*, very broad, prominently spreading, nerved and usually minutely dotted. Indian Territory to Louisiana and Texas.

66.—CAREX FESTIVA, Dewey, var. STRICTA.

Culm long and rather stiff (2 to 2½ ft.), exceeding the leaves; leaves stiff and the lower ones short, as in *C. straminea*; head very dense, globular or short-ovoid, light brown (¾ to 1 in. long); perigynium broad, more or less nerved. California, *Palmer* 389, *Kellogg* and *Harford* 1073; Buck Creek, Oregon, *Howell* 938. Aside from the congested head, this plant has the appearance of *C. straminea*.

Var. VIRIDIS.

Culm very long and lax (3 ft. or more); leaves shorter than the culm but loose and lax; head very dense, globular or nearly so; perigynium very thin, green, broader and twice longer than the brown muticous scale and therefore giving the head a green appearance. Montana: 16 mile Creek, *Scribner* 315; Park Co., *Tweedy*. Perhaps a good species.

Var. PACHYSTACHYA.

C. pachystachya, Chamisso; Steud. Plant. Cyp. 197 (1855), v. s. Hb. Lenorm.

Culm more or less prolonged (1 to 3 ft.), flat and weak, longer than the lax leaves; head small, globular or oblong, dull dark brown, the spikes often somewhat distinct, very short; perigynium spreading, about the length of or somewhat longer than the ovate-lanceolate muticous brown scale. Park Co., Montana, *Tweedy;* Portland, Oregon, *Henderson;* Alaska, *Chamisso.*

67.—CAREX PRESLII, Steud. Plant. Cyp. 242 (1855).

C. leporina, Presl, Reliq. Hænk. 204 (1830); Bailey, Coulter's Man. 396 (1885).

C. leporina, var. *Americana*, Olney, Proc. Amer. Acad. Arts and Sci. viii. 407 (1872), v. s.

The American plant is specifically distinct from *C. leporina*, L. Steudel founded his *C. Preslii* upon the description of Presl's *C. leporina*. The orginal does not exist, either in the collection of Presl or Steudel, but I adopt Steudel's name in lieu of any other. *C. petasata*, Dewey, Sill. Journ, (I). xxix. 246 (1836), referred here by Boott, cannot be pressed into service. The original sheet is in Herb. Torr. It contains three plants: *C. lagopina*, Wahl., *C. festiva*, Dewey, and *C. Liddoni*, Boott, to all of which Dewey's description will equally apply.

68.—CAREX APERTA, Boott, Hook. Fl. Bor.-Am. ii. 218, t. 219 (1840), v. s. Hb. Boott.

C. acuta, var. *prolixa*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 86 (1886).

The confusion into which Boott's *Carex aperta* has fallen is explained in Bot. Gaz. xiii. 84 (1888), and the opinion there expressed that the species is confined to our northwestern coast is verified by an examination of Boott's material. The plant referred to *C. aperta* in the Eastern States is *C. stricta*, var. *decora*, Bailey, l. c. 85.

69.—CAREX ACUTINA.

C. acuta, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 86 (1886).

A fine suite of specimens of *Carex acuta* given me by Arthur Bennett, Croydon, England, and a study of the species in various foreign herbaria, have enabled me to draw lines of separation between the European plant and the western plants which have been referred to it. *C. acutina* differs from *C. acuta* in the pale color of the plant and its lesser size and thin leaves, habitually smaller spikes, thinner and shorter perigynium, which is much less prominently nerved, and the lighter colored obtuse or muticous scales. Oregon, *Howell* 935, *Henderson;* British Columbia, *Dawson.*

The *C. acuta* credited to Greenland by Drejer (Rev. Crit. Car. Bor. 13, No. 31), and cited by myself (Proc. Amer. Acad. l. c.), is *C. vulgaris*, var. *hyperborea*, Boott (v. s. Hb. Havn. and *teste* Lange).

Var. TENUIOR.

Tall but more slender; leaves narrower; spikes shorter (an inch or less long) and narrow, more scattered; perigynium smaller. Oregon, "margins of lakes," *Howell;* Washington, in water on sub-alpine slopes of Mt. Adams, *Henderson* 1489.

70.—CAREX TETANICA, Schk., var. WOODII.

C. Woodii, Dewey, Sill. Journ. (II.) ii. 249 (1846); Sartw. Exsicc. No. 79 (1848), v. s.

C. panicea, var. *Woodii*, Olney, Exsicc. fasc. ii. No. 27 (1821), v. s.

C. tetanica, "a slender form," Bailey, Herb. Distr. 1886.

Very slender, often tall (1 to 2½ ft.), widely spreading by slender runners; spikes very slender, alternately flowered. Woods, New York and Michigan and south to Washington.

Var. CANBYI, Porter, Car. Penn. 9, in Proc. Phila. Acad. Nat. Sci. 1887.

C. panicea, var. *Canbyi*, Olney, Exsicc. fasc. ii. Nos. 24 and 25 (1871), v. s.

Usually stouter than var. *Meadii*, Bailey, the leaves broader and flatter (2 lines wide); spikes usually heavier; perigynium larger, the point scarcely bent; scale larger, nearly as long as or longer than the perigynium, acute or muticous. Delaware Co., Penn., *Canby;* Illinois, *E. Hall.* Olney's labels of his No. 24 bear both the above localities and I am not certain as to which locality my specimens are from. I have the same plant from Lapham, labelled, "prairies," probably from Illinois.

C. tetanica, var. *Carteri*, Porter, l. c., is var. *Meadii*, Bailey, v. s. and *teste* Porter.

71.—CAREX TERETIUSCULA, Gooden., var. AMPLA.

Very large and stout, growing three feet or more high in dense tufts; heads large (2 to 3 in. long), much branched, chaffy; perigynium twice larger than in the species, nerved on the back, shining at maturity, produced into a long beak. Quaking bogs, head of Burnt River, E. Oregon, *Cusick* 1331, near Salem, *Howell.*

72.—CAREX PSEUDO-CYPERUS, var. AMERICANA, Hochst. Herb. Unio Itin. (1837), v. s. Hb. Berol.

C. furcata, Ell. Sk. Bot. Car. ii. 552.

C. Pseudo-Cyperus, Schw. and Torr. Monogr. 335 (1825).

C. comosa, Boott, Linn. Trans. xx. 117 (1846), v. s. Hb. Boott.

C. Pseudo-Cyperus, var. *comosa*, W. Boott, Bot. Cal. ii. 252 (1880).

73.—CAREX HYSTRICINA, Muhl., var. DUDLEYI.

C. Pseudo-Cyperus × *C. hystricina?* Dudley, Cayuga Fl. 118 (1886), v. s. Hb. Cornell.

Usually taller than the species; spikes longer and slimmer (1½ to 2½ in. long), light-colored, all prominently spreading or nodding on one side of the culm; perigynium more ascending, somewhat deeper-toothed, yellower at maturity; scale longer, and prominent. Wethersfield, Conn., *Wright;* near Ithaca, N. Y., *Dudley;* Wisconsin? *Lapham.* The spikes have much the general aspect of *C. Schweinitzii*, Dewey.

74.—CAREX GRAYII, Carey, var. HISPIDULA, Gray in herb.

Perigynium evenly but sparsely hispid. As this is the only instance in which a member of the Section Physocarpæ has hairy perigynia, it seems worth while to recognize the variety.

75.—CAREX PARRYANA, Dewey, var UNICA.

C. Hallii, Hayden's Rep. 1871, 496, v. s. Hb. Gray.

Spike single and terminal, or sometimes attended by a small or rudimentary one; perigynium usually broader and more conspicuously beaked; scales larger. Pleasant Valley, Idaho, *Hayden.* Evidently dicœcious.

76.—CAREX TRIBULOIDES, Wahl. Köngl. Acad. Handl. xxiv. 145 (1803); Fl. Lapp. 250 (1812).

C. lagopodioides, Schk. Riedgr. Nachtr. 20, f. 177 (1806), v. s. Hb. Schk.; Sartw. Exsicc. No. 42 (1848), v. s.; Boott, Ill. t. 370 (1862).

C. scoparia, var *lagopodioides*, Torr. Monogr. 394 (1836).

C. lagopodiodes, var. *composita*, Olney, Exsicc fasc. ii. No. 10 (1871), v. s., and forma *glomerata*, l. c. fasc. i. No. 6, v.s.

This species is a tall and stiff plant, usually three feet or more high, with a stout head of long and ascending green spikes. I

was unable to find Wahlenberg's original, but it was probably the same collection as Schkuhr had, as Wahlenberg appears to have obtained many of his American plants through Willdenow and Schkuhr. Schkuhr's fig. 177 cannot pass for any other species than the one under consideration, however, and Wahlenberg says (Fl. Lapp. 250) that his species is the same as this figure.

In order to properly understand *C. tribuloides*, it is necessary to throw its variations into two series, as follows:

I.—Heads green or greenish.

Var. CRISTATA, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 148 (1886).

C. cristata, Schw. Ann. N. Y. Lyc. Nat. Hist. 66 (1824), v. s. Hb. Schw.; Boott, Ill. t. 372 (1862).

C. straminea, var. *cristata*, Tuckm. Enum. Meth. 18 (1843).

C. lagopodioides, var. *cristata*, Carey, Gray's Man. 1848, 545; Olney, Exsic. fasc. i. No. 7 (1871), v. s.

Tall and stout; head stout and erect, more or less continuous, composed of several to many globular dense spikes; perigynium long-pointed and spreading, giving the spikes a cristate appearance. Pennsylvania to New England and westward to Iowa.

Var. TURBATA.

C. tribuloides, Herb. Unio Itin. No. 204 (1837), v. s. Hb. Berol.

C. lagopodioides, var., Boott, Ill. t. 371, f. 1 (1862).

Plant slender and lax; head an inch or two long, loose, slender, mostly greener than in the last; spikes obovate-oblong (¼ to rarely ½ inch long), contracted below, the lower ones usually distinct or even alternate, becoming tawny, if at all, only when the perigynia begin to fall; perigynium ascending, the points not conspicuous. Shady copses and woods, Massachusetts to Michigan and southward to Alabama, *Mohr*, and S. Louisiana, *Langlois*. Evidently not common.

II. Heads tawny or brown.

Var. BEBBII.

C. Bebbii, Olney, Exsicc. fasc. ii. No. 12 (1871), v. s.

Head dense, ovoid or oblong, short (¼ to ¾ inch long, or rarely an inch), the lower spike only rarely distinct; spikes small

(¼ inch or less in length), their axes ascending; bracts at the base of the head small, or none. Dry low grounds; generally distributed in the Northern States as far west as Dakota and Nebraska. Ordinarily included in var. *cristata*.

Var. REDUCTA, Bailey, l. c.

C. scoparia, var. *moniliformis*, Tuckm. Enum. Meth. 17 (1843).

C. cristata, Boott, Ill. t. 373 (1862).

C. lagopodioides, var. *moniliformis*, Olney, Exsicc. fasc. ii. No. 8 (1821), v.s.; Bailey, Bot. Gaz. x. 380.

Culm slender, especially above, surpassing the long-pointed and lax leaves; spikes two to ten, small, nearly globular or somewhat contracted below (three lines or less in diameter), all distinct, the lowest alternate; perigynium conspicuously spreading. Connecticut to New Brunswick, and west to Minnesota.

77.—CAREX GRISEA, Wahl., var. (?) RIGIDA.

Whole plant rigid; leaves narrow, about the length of the culm; staminate spike an inch long, mostly peduncled; pistillate spikes two or three, widely scattered, peduncled, or the upper sessile, an inch or less long, loosely flowered; perigynium long-elliptic, prominently trigonous, not turgid, finely striate, distichously arranged, longer than the broad-based and prominently awned scale. Sellersville, Pennsylvania, *Fretz;* Faulkland, Delaware, *Commons;* Florida, *Chapman*. A singular plant, which I do not understand. Chapman's plant, which Dr. Boott referred to *C. grisea*, var *angustifolia*, is the least characteristic of the three.

78.—CAREX FILIFORMIS, L., var. AUSTRALIS.

Spikes commonly thicker than in the type; perigynium oblong or elliptic, usually twice, or nearly so, as long; scales much longer and strongly acuminate. Central Europe: common. The Scandinavian plant, which Linnæus described, appears to be the same as the American.

79.—CAREX DONNELL-SMITHII.

One of the *Polystachyæ*, standing next to *C. melanosperma*, Liebm.: Plant tall and stout (3 feet high), the lower sheaths purple and becoming shreddy; leaves as long as the culm, rather stiff, roughish on the margins; spikes twenty or more, one to three inches long, rather loosely flowered,

the staminate portion about half an inch long; main bract leafy and very much prolonged (a foot or more in length); perigynium lanceolate in outline, not trigonous, divaricate and much bent, provided with two or three prominent ribs and a few intermediate nerves, produced into a slender and sharply short-toothed beak about half the length of the body and somewhat rough on the margins; all the scales conspicuously lacerate-awned, those of the staminate portion more or less appressed, the pistillate divaricate and about the length of the perigynium. (107*a*). Pansamalá, Department of Alta Verapaz, Guatemala, altitude 3,800 feet, *H. von Türckheim*, 659; communicated by John Donnell Smith. The plant is abnormal in one respect, the top of the culm being fasciated, rendering the head of spikes very short and compact. The perigynia, however, and particularly the awned and lacerate staminate and pistillate scales, designate it from all other species with which I am acquainted. The perigynium of *C. melanosperma* is smaller, straighter, and much shorter-beaked, the beak entire or oblique, and is less prominently nerved (See No 94).

80.—CAREX ROSEA, Schkuhr, var. RETROFLEXA, Torr. Monogr. 389 (1836).

C. retroflexa, Muhl. Willd. Sp. Pl. iv. 235 (1805), v. s. Hb. Willd.; Boott, Ill. t. 226 (1860).

C. bicostata, Olney, Exsicc. fasc. iv. No. 17 (1871) v. s.

New England to Pennsylvania and westward through New York.

Var. TEXENSIS, Torr. Monogr. 389 (1836).

Var. *retroflexa*, authors, in part.

More slender than the last; perigynium very narrow, usually narrowly lanceolate, longer beaked than in the last, much more conspicuously spreading or reflexed. Mt. Carmel, S. Illinois, *Schneck*, and from Alabama to Texas.

81.—CAREX ECHINATA, Murray, Prodr. Stirp. Gotting. 76. (1770.)

The type of this species does not occur in the Eastern United States so far as I can determine. Specimens from the Pacific slope appear to be the same as the European plant, yet more material is needed to warrant a definite reference. American varieties of this species may be defined as follows:

Var. CEPHALANTHA.

Rather stiff but slender, 1 to 2 feet high; leaves very narrow and involute, about the length of the culm; spikes five to eight, approximated and often forming a head, mostly short-oblong or nearly globular, compactly fifteen- to thirty-flowered, green; perigynium ovate-lanceolate, spongy-thickened below, rough on the angles above, nerved on both faces, spreading or somewhat reflexed, the beak long and prominent, longer than the sharp white and thin scale. E. Pennsylvania, *Porter;* Ashland, Mass., *Morong;* Tompkins Co., N. Y., *Dudley;* Jefferson Co., N. Y., *Crawe;* and Keweenaw Co., Michigan, *Farwell.* Before fully mature, the spikes are not stellate, and specimens may readily be mistaken for *C. canescens*, var. *polystachya*, Boott, to which plant Morong's specimens were referred in my Synopsis. (See addendum.)

Var. CONFERTA, Bailey, Carex Cat. (1884.)

C. stellulata var. *conferta*, Chapm. Flora S. States, 534. (1860.)

Very stiff; spikes contiguous or scattered, spreading, globular or short-oblong, densely flowered; perigynium broadly ovate or even nearly round-ovate, very strongly nerved, reflexed or spreading. Near the sea-coast from Newfoundland to Florida.

Var. MICROSTACHYS, Bœckeler, Linnæa, xxxix. 125 (1875.)

C. sterilis, Willd. Sp. Pl. iv. 208 (1805), v. s. Hb. Willd.

C. scirpoides, Schkuhr, Riedgr. Nachtr. 19, f. 180 (1806), v. s. Hb. Schk.

C. stellulata, vars. *scirpoides* and *sterilis*, Carey, Gray's Man. 1848, 544.

C. echinata, var. *microstachya*, Bœckl. Flora, 1875, 563.

C. echinata, var. *microcarpa*, Bailey, Coulter's Man. Rocky Mt. Bot. 395 (1885.)

Mostly very slender and often weak; spikes few, three- to ten-flowered, usually tawny; perigynium small, lance-ovate, nerved on the outer face but usually nerveless on the inner, erect or spreading, the beak rather long. From Canada to the Gulf States, and evidently across the continent. Common and variable.

Var. ANGUSTATA, Bailey, Carex Cat. (1884.)

C. stellulata, var. *angustata*, Carey, Gray's Man. 1848, 544.

Very slender; spikes few and very few-flowered, mostly all contiguous; perigynium lanceolate or linear-lanceolate, twice or more the length of the scale. New York, Vermont and northward. Rare.

82.—CAREX FULVA, Gooden., was described by its author as coming from Newfoundland as well as England. With the exception of an adventitious plant found over fifty years ago at Tewksbury, Mass., by B. D. Greene, the plant has not been catalogued from America since Goodenough's time. Goodenough's originals in Hb. Kew. explain the perplexity. Part of the sheet is *C. fulva*, and part is an immature form of *C. flava* (evidently *C. flava* var. *graminis*, Bailey). The *C. flava* is undoubtedly the Newfoundland plant.

83.—CAREX ROSTRATA, Stokes, in With. Arr. Brit. Pl. 2nd Ed. 1059 (1787).

Jonathan Stokes assisted in the preparation of Withering's second edition, and his initials are appended to the above species. Although Withering's Carices are not known to be in existence, there can be no doubt that the *C. rostrata* of Stokes is the same as *C. ampullacea* of Goodenough. Stokes refers to Leer's figure of *C. vesicaria*, α (Fl. Hert. t. 16, 2), and this figure is unmistakably Goodenough's *C. ampullacea*. It is a singular circumstance that Schkuhr in the index to his Nachtrag (1806) makes "*C. rostrata*, Weith." a synonym of *C. ampullacea*. "Weith." is undoubtedly meant for "With." Hudson's *C. vesicaria* (Fl. Angl. Ed. i. 353 (1762)) is the same plant.

84.—CAREX UTRICULATA, Boott, Hook. Fl. Bor.-Am. ii. 221 (1840), v. s. Hb. Boott.; Ill. 14, t. 39 (1858.)

C. ampullacea, var. *utriculata*, Carey, Gray's Man. 1848, 566.

C. rostrata, var. *utriculata*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 67 (1886.)

A study of much material, in field and herbarium, renders the differences between the European *C. rostrata* and our plant apparent. Ever since collecting the slender form of our plant

which has been referred to the European species, and failing to detect the stoloniferous character which is characteristic of *C. rostrata*, it has appeared that the two plants are specifically distinct. From the European species, *C. utriculata* is separated by grosser habit, lack of stoloniferous character, broader and proportionately shorter leaves, heavier and more scattered spikes, of which the lower are less peduncled, and much sharper scales. *C. rostrata* is a much neater plant, with slim, compact and evenly cylindrical spikes which are somewhat approximated near the top of the culm. Our species runs imperceptibly into

Var. MINOR, Boott, l. c.

C. utriculata, var. *globosa*, Olney, Bot. King's Rep. 374. (1871).

C. rostrata, Bailey, l. c.

Smaller throughout; leaves narrower and less nodulose; spikes 2½ in. or less long; perigynium smaller; scales muticous. With the species.

85.—WAHLENBERG'S CARICES.

Aside from the species reviewed in the preceding pages the following have been seen:

v. s. Hb. Wahl.

C. microglochin.

C. Buxbaumii: C. fusca, All.

C. ustulata: C. atrofusca, Schk.

C. pedata.

C. canescens, var. *alpicola.*

C. tenuiflora.

C. lagopina.

C. glareosa.

C. aquatilis. It is not certain that the American plant is the same as the European.

v. s. Hb. Holm.

C. castanea, Köngl. Acad. Handl. xxiv. 155 (1803). *C. flexilis*, Rudge, Linn. Trans. vii. 98, t. 10 (1804), v. s. Hb. Kens.

C. cladostachya, *C. polystachya*, and *C. scabrella* are in Hb. Swartz.

The following of Wahlenberg's originals do not appear to be

in existence: *C. tribuloides, leptalea, Pyrenaica, grisea, prasina, xanthophysa.* In Thunberg's herbarium, at Upsala, is a specimen called *C. latifolia,* but evidently not labelled by Wahlenberg himself, and it is *C. plantaginea,* Lam., as commonly supposed. The figures in Schkuhr with which Wahlenberg compares his *C. grisea* and *C. tribuloides* are unmistakable, and the conditions of publication of *C. leptalea* also leave no doubt as to the disposition of this species (*C. polytrichoides,* Muhl.). Schkuhr's figure of *C. miliacea,* which Wahlenberg cites under his *C. prasina* (Fl. Lapp. 250), is less characteristic.

86.—MUHLENBERG'S CARICES

Aside from those heretofore mentioned:

v. s. Hb. Willd.

C. marginata: C. Pennsylvanica, Lam.

C. granularis.

C. pubescens.

C. polytrichoides.

C. cephalophora.

C. pedunculata.

C. retroflexa: C. rosea, var. *retroflexa,* Torr.

C. sparganioides.

C. multiflora: C. vulpinoidea, Michx., a slender-spiked form.

C. virescens, a slender and short-spiked form. *C. triceps* var *hirsuta,* Bailey, is also on the same sheet, but the description applies to *C. virescens.*

C. trichocarpa.

C. pellita: C. filiformis, var. *latifolia,* Bœckl.

C. hystricina.

C. miliacea: C. prasina, Wahl.

C. stipata.

87.—WILLDENOW'S CARICES, addendum:

v. s. Hb. Willd.

C. lucorum: C. Pennsylvanica, Lam.

C. supina: C. obesa, var. *minor,* Boott. Perhaps worthy of specific rank.

C. sterilis: C. echinata, var. *microstachys,* Bœckl.

C. digitalis.

C. lacustris: C. riparia, Curt.

C. folliculata: C. intumescens, Rudge.

C. macrocephala.

C. juncea: C. ferruginea, Scop. ! This species is recorded as coming from North America, and Kunth and others have made the name supplant Buckley's *C. miser*, a name applied to a local species from the mountains of North Carolina. Willdenow founded his species upon cultivated plants, which were evidently mixed in the garden. The specimens included in the cover of *C. juncea* are of two species. Sheet No. 1, taken by Kunth as the type, is *C. ferruginea*, Scop. The other sheets, as indicated by Kunze in the herbarium, are *C. umbrosa*, Host. Buckley's name, *C. miser*, must therefore stand for the American plant.

C. inundata, Willd, in herb.; Schlecht. Linnæa, x. 267: *C. verrucosa*, Muhl.

C. pinetorum, l. c.: *C. Muhlenbergii*, Schk.

C. Bosci, Willd. in herb.; Spreng. Syst. Veg. iii. 812 (1826); Schlecht. l. c.: *C. stipata*, Muhl.

C. lonchicarpa, Willd. in herb.; Spreng. l. c.: *C. folliculata*, var. *australis*, Bailey.

C. Norvegica, v. s. Hb. Schk.

88.—SCHKUHR'S PLANTS, addendum; v. s. Hb. Schk.

C. polygama: C. fusca, All.

C. oligocarpa.

C. conoidea.

C. laxiflora: C. grisea, Wahl.

C. atrofusca.

C. umbellata.

C. rosea.

C. scirpoides: C. echinata, var. *microstachys*, Bœckl.

C. lagopodioides: C. tribuloides, Wahl.

C. scoparia.

C. refracta, Schk.* in Willd. Sp. Pl. iv. 297 (1805); Riedgr. Nachtr. 62, f. 136 (1806). *C. tenax*, Reuter, Compte Rendu Trav. Soc. Hallérienne, 1852–'6, 130!

*There is often uncertainty as to whether Willdedow or Schkuhr should be cited as authority for species which were published almost simultaneously. In the index to his Nachtrag, Schkuhr appears to be careful to give proper credit for the suggestion of the name, and I have followed him.

This species has been the occasion of misunderstanding from Schkuhr's time to the present.* Neither European nor American botanists have taken it up, although credited to both countries. It has been, perhaps, the most puzzling feature in our Carex synonymy. The best specimens are in Willdenow's herbarium. Professor Ascherson suggested to me the identification of the plant with Reuter's *C. tenax* of the Italian Alps.

The three following of Schkuhr's species are not in his herbarium, nor in Willdenow's: *C. bullata, tetanica, Muhlenbergii.*

C. bromoides and *C. Willdenovii* are in Hb. Willd.

89.—ALLIONI'S PLANTS. v. s. Hb. All.

C. rupestris.

C. juncifolia: C. incurva, Lightf.

C. fœtida.

C. nigra: C. atrata, var. *nigra*, Boott.

C. bicolor.

C. fusca, All. Fl. Ped. ii. 269 (1785). *C. polygama*, Schk. Riedgr. 84, t. 76 (1801), v. s. Hb. Schk. *C. Buxbaumii*, Wahl. Köngl. Acad. Handl. xxiv. 163 (1803), v. s. Hb. Wahl. Although Allioni places this species in the section characterized by "Spicis pluribus sexu distinctis: mare unica," it has an androgynous terminal spike. It is represented by a good specimen.

C. frigida.

C. patula: C. sylvatica, Huds.

C. bipartita: Kobresia caricina, Willd. Allioni's figure of this plant is not characteristic, yet the specimens are unmistakable and their history is clear. In Balbis' herbarium, at Turin, the same plant is labeled *C. bipartita.*

Some of Allioni's species are not known to be in existence, and his figures are poor. His figure of *C. trigona*, however, appears to leave no doubt that he meant the plant named by Linnæus *C. distans.*

90.—LAMARCK'S CARICES, addendum; v. s. Hb. Lam.

C. Magellanica.

*For a brief discussion of the perplexity, consult Proc. Amer. Acad. Arts and Sci. xxii. 118, 1886.

C. Pennsylvanica.
C. plantaginea.
C. crinita.

91.—MICHAUX'S CARICES, addendum; v. s. Hb. Michx.

C. leporina: In part *C. scoparia*, Schk., and in part a small form of *C. straminea*, Willd.
C. subulata.
C. rostrata: C. Michauxiana, Bœckl.
C. oligosperma.
C. typhina: C. squarrosa.
C. lanuginosa: C. filiformis, var. *latifolia*, Bœckl.
C. lenticularis. One specimen is a much reduced *C. stricta*, Lam.
C. paupercula: C. Magellanica, Lam.
C. scirpoidea.
C. microstachya: C. polytrichoides, Muhl. In Michaux's herbarium the plant is labelled *C. leptostachya.* The name was evidently changed when put into print.
C. vulpinoidea. A small form.
C. Richardii: type of *C. canescens*, L. A specimen from Paris and one from Canada. Michaux attributes the name to Thuill.
C. folliculata: C. intumescens, Rudge.
C. plantaginea: C. platyphylla, Carey.

92.—DREJER'S CARICES, addendum; v. s. Hb. Havn.

C. anguillata. Appears to be a good species. From *C. vulgaris*, var. *hyperborea*, it is distinguished by its elliptic, papery, whitish and puncticulate perigynia, obovate and obtuse scales, and looser-flowered spikes. T. MMDCCCXLVI. Flora Danica, is a characteristic plate. The original specimens are from Iceland, but Lange reports it from Greenland, also. Dr. Boott referred the species to *C. aquatilis*, var. *minor*, Boott.
C. holostoma. I referred this plant to *C. alpina* as var. *holostoma* (Proc. Amer. Acad. Arts and Sci. xxii. 76). It appears to be a well characterized species, however. T. MMCCCCXXVIII. Fl. Danica, is a good illustration of it.

C. hyperborea: C. vulgaris var. *hyperborea*, Boott. Vars. *infuscata, lutosa* and *pudica* of *C. rigida*, are apparently mere incidental forms of *C. vulgaris* var. *alpina*, Boott.

C. nigritella: C. stylosa, Meyer.

C. lagopina, var. *pleiostachya* does not appear to be worth separating.

C. pratensis.

C. stans. Following Dr. Boott, I should call this a form of *C. aquatilis*, Wahl.

C. reducta: C. subspathacea, Wormsk.

C. subspathacea, vars. *stricta* and *curvata: C. subspathacea*, Wormsk.

93.—OTHER DANISH-GREENLAND CARICES; v. s. Hb. Havn.

C. canescens, vars. *robusta* and *robustior*, Blytt, appear to be inseparable from the species.

C. Drejeriana, Lange, Fl. Dan. fasc. 50 (1880), 10, t. MMD CCCCLXXV. (not *C. Drejeri*, Lang). The table is characteristic, except that it appears to represent the leaves as rather too broad. Perigynium elliptic-oblong, thin and light-colored, very blunt, exceeding the obtuse purple white-nerved scale, nerveless and puncticulate. The peduncled and short spikes are characteristic of the species.

C. lagopina, var. *debilis*, Lange, Fl. Groen. 135 (1880);

C. misandra, var. *elatior*, Lange, l. c. 140. Both these varieties are well marked.

C. rotundata, var. *elatior*, Lange, does not appear to differ in any important respect from the species as it occurs in Scandinavia.

C. rigida, var. *inferalpina*, Læst.: *C. vulgaris*, var. *hyperborea*, Boott.

C. Grœnlandica, Lange, Fl. Grœn. 144 (1880), Fl. Dan. t. 2845, appears to be inseparable from *C. vulgaris*, var. *hyperborea*, Boott.

C. Fyllæ, Holm, is *C. vulgaris*, var. *alpina*, Boott, perhaps with somewhat broader leaves than usual.

C. Warmingii, Holm, is *C. vulgaris*, var. *hyperborea*, Boott, a short form.

C. duriuscula, Meyer, of Fl. Grœn. appears to be small *C. incurva*, Lightf.

In this connection it may be remarked that var. *subloliacea*, Læst. of *C. canescens*, is a very different plant from *C. canescens*, var. *vulgaris*, Bailey. (See Bot. Gaz. xiii. 85, where remarks were made concerning these plants). As compared with the var. *vulgaris*, var. *subloliacea* has shorter and rounder perigynia,—more like those of the type of the species,—and which are silvery in color and somewhat puncticulate.

94.—LIEBMANN'S MEXICAN CARICES addendum;
v. s. Hb. Liebm.

C. Cortesii: C. Jamesoni, Boott.

C. chordalis: C. Jamesoni, var. *gracilis*, Bailey, Bot. Gaz. xiii. 88; *C. Jamesoni*, β. Boott.

C. Orizabæ: C. festiva, Dewey.

C. leporina, var. *bracteata: C. straminea*, var. *fœnea*, Torr.

C. melanosperma. It has the aspect of forms of C. *Jamesoni*, Boott, but the perigynia are very different (see No. 79). The "rough-ciliate mucro" of the pistillate scales is not pronounced.

C. maculata is *C. psilocarpa*, Steud. Pl. Cyp. 195 (1855). Boott's *C. maculata* is an older name.

C. olivacea: C. monticola, Bœckl. Engler's Bot. Jahr. i. 364 (1881); *C. androgyna*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 101 (1886). Boott's *C. olivacea* is an older name.

C. anisostachys. A fine species, allied, with the last, to *C. virescens*, Muhl. *C. monticola* has more the port of *C. virescens*, as the pistillate portion of the terminal spike is longer than in this species. *C. anisostachys* has toothed perigynia, while those of *C. monticola* are entire, and the scales in *C. anisostachys* are much more acute than in the other. The terminate spike is rarely all staminate.

Var. CHLOROCARPA.

C. chlorocarpos, Liebm.

C. Liebmanni, Walpers.

Lower (6–12 in. high), and more slender, the leaves not hairy, (they are very slightly so in the species); spikes smaller; peri-

gynium usually shorter and scales commonly more obtuse. Simply a reduced form of *C. anisostachys.*

C. tuberculata. A clear species, with somewhat the port of narrow-spiked *C. verrucosa*, Muhl.

C. rhynchophysa : C. physorhynca, Steud. Bœckeler (Engler's Bot. Jahr. i. 364), refers this species to *C. nigro-marginata*, Schw. I can see no essential difference between the plant and *C. nigro-marginata*, but as this species has not been found south of Carolina, the union may be delayed until more material accumulates.

C. turbinata. (See No. 48). Much like *C. communis*, Bailey, from which it is distinguished, among other things, by the strongly nerved pergynia. *C. rigens* Bailey, appears to be a distinct species, and the following points of contrast between the two may be made: *C. turbinata:* Culms rather slender; staminate spike not prominent; bracts narrow, usually not much prolonged; perigynium very short-beaked and entire; scales hyaline-brown on the margins, obtuse or muticous, not prominently nerved. Schaffner's No. 222 from San Luis Potosi is this species (v. s. Hb. Berol., where it is named *C. Halleriana* by Bœckeler); *C. rigens*: Culms stout and stiff; staminate spike large and prominent; bracts, particularly the lowest, leaf-like and longer (3 to 4 in. long); perigynium larger, longer beaked, the beak sharply cut into short membranaceous white teeth; scales very acute or rough-awned with white-hyaline margins, green nerved on the back.

v. s. Hb. Örst.

C. Örstedii. Much like C. *cladostachya*, Wahl., but the panicle contains fewer spikes (3 to 4 spikes, or sometimes more), which are longer and more erect; perigynium straight or nearly so, not divergent, less strongly nerved. Plant stouter and more erect than *C. cladostachya.* Evidently nearer *C. polystachya*, Wahl.

C. acrolepis. Looks much like a small and abnormal *C. cladostachya.* Spikes very few in the panicle, sometimes reduced to one and never more than three, staminate portion very small or even wanting, ascending or erect; perigynium erect and straight, the scales very sharp and

rough. It has even somewhat the aspect of *C. anisostachys.*

95.—ROBERT BROWN'S NORTH AMERICAN CARICES.*

All but *C. attenuata*, are in the herbarium of the Natural History Museum at South Kensington. This species was seen in Hb. Hooker. by Dr. Boott, and by him referred to *C. rupestris* All.

C. affinis, R. Br. Frankl. Narr. App. 763, was referred by Dr. Boott to *C. obtusata*, Lilj. Three sheets were placed together in the museum, the specimens all collected on the same expedition, of which two sheets are not labelled, but are evidently *C. obtusata*, although too young for positive determination. The third sheet is Brown's type of *C. affinis*, and is *Kobresia scirpina*, Linn.

C. concolor, Suppl. App. Parry's Voy. 218: *C. vulgaris*, var. *alpina*, Boott.

C. podocarpa, Frankl. Narr. App. ed. ii. 36, has been entirely misunderstood. It is apparently a form of *C. atrofusca*, Schk. (*C. ustulata*, Wahl.). From most specimens of *C. atrofusca* it differs more or less in the entire orifice of its perigynium, which is not at all puncticulate, somewhat narrower spikes, and broader leaves. But *C. atrofusca* is a variable species, and in the absence of more and better material, I throw the two together for the present. The plant which has passed for *C. podocarpa* R. Br. (Boott. Ill. 197; Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 94), is *C. macrochæta*, Meyer.

The following species are properly understood by American botanists:

C. aristata, Frankl. Narr. App. 764: *C. trichocarpa* var. *aristata*, Bailey.

C. Richardsoni, Frankl. Narr. App. 763.

C. misandra, Suppl. Parry's Voy. 283.

C. concinna, Frankl. Narr. App. 763.

C. compacta, Ross's Voy. App. cxliii.

C. media, Frankl. Narr. App. 763: *C. alpina*, Swtz.

C. mutica, Frankl. Narr. App. 763: *C. aurea*, Nutt.

*Most of the notes on Brown's and Rudge's Carices were also printed in Journ. Bot. xxvi. 321-323 (Nov. 1888).

96.—PRESL'S CARICES, addendum; v. s. Hb. Presl.

C. anthericoides: *C. macrocephala*, Willd.

C. Mexicana: *C. cladostachya*, Wahl.

C. anthoxanthea: *C. leiocarpa*, Meyer.

There is some doubt as to the priority of these last two names. Presl published *C. anthoxanthea* in 1830. Meyer presented his paper, in which was published *C. leiocarpa*, in 1825, but the Memoirs of the St. Petersburg Academy, in which it was printed, did not appear until 1831. Meyer's paper was separately distributed, however, and it is probable that it was published soon after 1825.

97.—STEUDEL'S NORTH AMERICAN CARICES, addendum:

(The figures refer to pages in Steudel's Synopsis Plantarum Cyperacearum.)

v. s. Hb. Steud.

C. picta, 184. (Not Boott, 1859.): *C. Boottiana*, Bentham; Boott in Journ. Bost. Nat. Hist. Soc. v. 112 (1845), v. s. Hb. Boott.; (not Hook. & Arn*.)

C. flaccidula, 199: *C. rosea*, Schk.

C. Fridrichsthaliana, 211: *C. vulgaris*, var. *hyperborea*, *Boott.*

C. subcompressa, 221: *C. prasina*, Wahl.

C. microsperma, 231: *C. flaccosperma*, Dewey.

C. basiantha, 232: *C. Willdenowii*, Schk.

C. amphibola, 234: *C. grisea*, var. *angustifolia*, Boott.

C. nana, Cham.: *C. capillaris*, Linn.

v. s. Hb. Lenorm.

C. abjiciens, 209: *C. Magellanica*, Lam.

C. Despreauxii, 237: *C. oligosperma*, Michx.

C. Beringiana, Cham. 229: *C. stylosa*, Meyer.

v. s. Hb. Berol. (Drummond's numbered specimens.)

C. oblita, 231: *C. venusta*, var. *minor*, Bœckl. (*C. glabra* Boott. *C. venusta*, var. *glabra*, Bailey.)

C. podostachys, 232: *C. digitalis*, Willd.

C. protracta, 234: *C. laxiflora*, var. *styloflexa*, Boott.

C. hyalinolepis, 235: *C. riparia*, Curtis. (Also v. s. Hb. Kew.)

C. Macroklea, 223: *C. verrucosa*, Muhl. (Also v. s. Hb. Kew.)

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*C. *BOOTTIANA*, Hook. & Arn. Bot. Beechey's Voy. 273 (1841). *C. Bongardiana*, Boott, Linn. Trans. xx. 144 (1845–6). Loo Choo.

Teste Bœckeler.

C. Kelvingtoniana, 215: *C. stricta*, Lam.
C. Watsoniana, 215: *C. stricta*, Lam.
C. rufidula, 220: *C. verrucosa*, Muhl.
C. aureolensis, 223: *C. stenolepis*, Torr.
C. familiaris, 226: *C. oxylepis*, Torr. and Hook.
C. chlalaros, 231: *C. granularis*, Muhl.
C. subbiflora, 234: *C. Pennsylvanica*, Lam. (Flora, 1856, 327.)
C. subuniflora, 234: *C. oligocarpa*, Schk.
C. Baazasana, 236: *C. Cherokeensis*, Schw.; also *teste* Boott.

C. nivalis, Cham. 184: *C. Pyrenaica*, Wahl.; (*C. micropoda*, Meyer, according to Boott).
C. spaniocarpa, 225 is founded upon t. 2176, Fl. Danica. This plate is *C. supina*, Willd. (*C. oligocarpa*, Hornem.), *teste* Lange, Nomen. Fl. Dan. 81 (1887).

98.—Bœckeler's North American Carices, addendum:

v. s. Hb. Berol.

C. pilosiuscula, Flora, 1882, 61: *C. Whitneyi*, Olney.
C. longicaulis, l. c. 62. Allied to *C. triquetra*, Boott, and *C. pubescens*, Muhl.
C. Ehrenbergiana. Has much the aspect of *C. crinita*, Lam., and *C. Prescottiana*, Boott. Perigynia very small for a species of its group.
C. Krausei, Bot. Jahr. 1886, 279; *C. capillaris*, var. *Krausei*, Krantz; Macoun, Pl. Can. iv. 163: *C. capillaris*, L.
C. Alaskana, l. c.: *C. gynocrates*, Wormsk.
C. Urbani, l. c.: *C. flava*, var. *viridula*, Bailey.
C. Saskatchewana: *C. capillaris*, L. Leaves rather unusually broad.
C. Fendleriana: *C. Douglasii*, Boott.
C. grisea, var. *minor*: *C. grisea*, var. *angustifolia*, Boott.
C. Virginiana, var. *elongata*: *C. stricta*, var. *Emoryi*, Bailey.
C. Deweyana, var., Linnæa, xxxix. 129: *C. longirostris*, Torr.
C. heptastachya, said to have come from Merida, Costa Rica, comes from Merida, Colombia, according to the label.

The species may be inseparable from tall forms of *C. straminea*, Willd.

C. brizoides, var. *nemoralis*, Wimmer, credited to Arctic America, does not occur in this country. This variety is the plant originally described by Linnæus, and the first application of the name should be restored.

C. tenuispica, Flora, 1856, 225, *C. tristicha*, Flora, 1858, 651, is *C. stricta*, Lam. (*teste* Bœckl. Linnæa xl. 431).

C. leucocarpa, Flora, 1856, 227: *C. Pennsylvanica*, Lam.

99.—SCHWEINITZ'S CARICES, addendum:

v. s. Hb. Schw.

C. costata: C. virescens, Muhl. var. *costata*, Dewey.

C. sempervirens: C. verrucosa, Muhl.

C. albolutescens: C. straminea, var. *fœnea*, Torr.

C. cristata: C. tribuloides, var. *cristata*, Bailey.

C. Pseudo-Cyperus: C. Pseudo-Cyperus, var. *Americana*, Hochst.

C. scabrata.

C. retrorsa.

C. Novæ-Angliæ.

C. nigro-marginata.

C. gracillima.

There are two tolerably well marked forms of *C. gracillima.* Schweinitz described the tall and broad-leaved form which grows in rich woods and copses. In open places and on harder soils, the species becomes dwarfed, and may then be known as

Var. HUMILIS.

Smaller, the leaves narrower; spikes often very small, two- to twelve-flowered, erect or ascending; perigynium mostly smaller.

C. Muskingumensis (*C. arida*, Schw. and Torr.).

*C. Cherokeensis.**

C. Deweyana.

**C. recurva*, Muhl., an older name for *C. Cherokeensis*, is incapacitated by Schkuhr's species:

C. RECURVA, Schkuhr, 1801.

C. Forsteri, Wahl., 1803. New Zealand.

C. Floridana.
C. Schweinitzii, Dewey.
C. granularioides: *C. conoidea.*
C. gynandra: *C. crinita.*
C. acuminata: *C. laxiflora*, var. *styloflexa*, Boott.

C. littoralis, Schw. 1824, is not in his herbarium, but it is an older name for *C. Barrattii*, Schw. and Torr., 1825, *teste* Schw. and Torr., and should stand. *C. variegata*, Scheele, Linnæa, xxiii. 565 (1850), is the same.*

C. stolonifera, Schw., according to the description, is *C. Pennsylvanica*, Lam. A specimen in the herbarium labelled *C. stolonifera*, with a query, is also *C. Pennsylvanica.*

C. Torreyana, Schw., is not in the herbarium. The description indicates that *C. monile* or *C. Tuckermani* was meant.

A specimen of *C. panicea*, L. from Boston, collected by H. Little, is in Hb. Schw., showing that the species has long been naturalized.

100.—MISCELLANEOUS NOTES.

C. intumescens, Rudge, Linn. Trans. vii. 97, f. 3, v. s. Hb. Kens., is properly understood by botanists.

C. flexilis, Rudge, l. c. is *C. castanea*, Wahl.

C. folliculata, Rudge, l. c. is *C. Michauxiana*, Bœckl.

C. commutata, Gay, Ann. Sci. Nat. 2nd ser. xi. 198, v. s. Hb. Paris., is *C. stricta*, Lam.

C. crus-corvi, Shuttl. is in Shuttleworth's herbarium at South Kensington, and is the species understood by botanists.

C. Tuckermani should be credited to Dewey rather than to Boott: Dewey, Sill. Journ. (I.), xlix. 48 (1845), and *teste* Dewey in Herb.; Boott, Linn. Trans. xx. 115 (1846).

C. flacca, Schreber, Spic. Fl. Lips., addendum (1771). *C. glauca*, Scopoli, Fl. Carniol. 2nd ed. ii. 223 (1772); Fl. Carniol. 1st ed. 214, without name (1760).

C. styloflexa, Buckley, v. s. Hb. Torr., is *C. laxiflora*, var. *styloflexa*, Boott.

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* *C. littoralis*, Petrie, Trans. New Zealand Inst. xv. 358, a recent species, may be known as C. LITOROSA.

ADDENDA.

CAREX STRAMINEA, Willd., var. RENIFORMIS.

Intermediate between var. *hyalina*, Boott, and var. *brevior*, Dewey: Spikes about four or five, all contiguous in an erect head, almost perfectly globular, dull greenish-tawny; perigynium thin and flat, broader than long and almost or quite reniform, the short beak very distinct, the wing margins very thin; plant about 18 in. to 2 ft. high, rather slender. Mississippi: Bogue Phalia, *Mohr*, Starkville, *Tracy*. E. Louisiana, *Langlois*.

CAREX CRINITA × TORTA.

More slender than *C. crinita*, the leaves narrower; spikes nearly as slender as those of *C. torta*; scales muticous or simply acute and little longer than the perigynium, or sometimes very short-awned. Moist meadows near the "Glen House," White Mountains, *Brainerd*.

C. LURIDA, Wahl. (*C. tentaculata*, Muhl.), var. FLACCIDA.

Low, scarcely exceeding a foot or fifteen inches high; spikes two to four, all sessile and approximated at the top of the culm, small and straight (an inch or less long), dull brown or reddish-brown, loosely flowered; perigynium very thin and membranaceous, the body mostly larger than in the species and more gradually contracted into the beak. Central N. York, *Dudley*, to New Jersey, *Ellis*. Its spikes lack entirely the dense and hystricinous aspect of the species. It is not improbable that it may be a mixture with *C. lupulina*, Muhl.

C. LURIDA × LUPULINA.

C. tentaculata, Muhl., var. *rostrata*, Sartwell, Exsicc. No. 138 (1848), v. s.

C. tentaculata, Muhl., var.? *altior*, Boott, Ill. 94, t. 278 (1860).

C. tentaculata × *lurida*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 69 (1886), mostly.

Much like some forms of *C. lurida*: Staminate spike sessile or very nearly so, after the manner of *C. lupulina*; pistillate spikes three or four, all approximated or nearly so, or the lowest separated, all sessile, erect or spreading, straight or often somewhat curved, densely flowered, green; perigynium long-beaked and ascending, causing the spike to lack the comose appearance of *C. lurida*. Very like *C. lupulina* × *retrorsa*, Dudley, but that plant has shorter and much looser, scattered spikes which are yellow or straw-colored and perigynium large and very thin and soft in texture. Amherst, Mass., Tuckerman, according to Boott; Wethersfield, Conn., *C. Wright*; Penn. Yan, N. Y., *Sartwell*.

C. VULGARIS, Fries, var. STRICTIFORMIS.

C. limula ? Gray, Man. 5th ed. 582 (1867).

Tall and lax (1½ to 2½ ft. high), the leaves long and narrow; staminate spike, longer peduncled; pistillate spikes looser and often longer than in the species, the perigynia never being so densely packed and usually becoming browner. Lower St. Lawrence, *Pringle* (distr. as *C. limula*, Fries); Nova Scotia, *Macoun*; Mt. Desert, Maine, *Greenleaf, Rand;* Dorchester, Mass., *Churchill;* Nantucket, *Morong*, and southward to E. Pennsylvania.

This plant stands midway between *C. vulgaris* and *C. stricta*. From the latter it is distinguished by not growing in tufts, its narrower and smoother leaves and very obtuse black or brown and white-nerved short scales.

CAREX PENNSYLVANICA, Lam., var. VESPERTINA.

Habitually taller than the species, very slender; staminate spike commonly slimmer and usually very short-peduncled; pistillate spikes more separated and the lowest subtended by a leafy bract from one-half inch to one inch long; perigynium mostly larger, more hairy, the beak longer and stouter. Oregon, "Dry hills near the cascades of the Columbia," *Howell*, and *Henderson* 1782, without locality; lower cascades of the Columbia, and Mt. Adams, *Howell;* "dry rocky places," Vancouver Island and British Columbia, *Macoun*. The Pacific coast representative of *C. Pennsylvanica*. In aspect it is much like *C. communis*, Bai-

ley, but is distinguished by the stoloniferous habit, the very narrow and dull leaves and the habitually darker spikes.

CAREX AUREA, Nutt., var. CELSA.

Taller than the species (15 to 20 in. high) and strict; spikes large and compactly flowered, evenly cylindrical, longer peduncled. San Bernardino Mts., California, *G. R. Vasey*, Portland, Oregon, *Henderson*, *Howell*. Very distinct in appearance.

CAREX CANESCENS, var. POLYSTACHYA, Boott, Rich. Journ. ii. 344.

C. arcta, Boott, Ill. 155, t. 497 (1867).

C. Kunzei, Olney, Exsicc. fasc. iv. No. 19 (1872).

Erect and mostly strict, not glaucous, 1½ to 2½ ft. high; leaves very lax and usually exceeding the culm; spikes oblong, green, more or less aggregated into a loose head, the lowest one or two subtended by a short and hyaline broad-based and pointed or caudate bract; perigynium more spreading than in the species. Maine, *Scribner*; Barnet, Vermont, *Blanchard;* "Low woods near the outlet of Lake Champlain," *Pringle;* low woods, extreme northern Minnesota, *Bailey;* "Canada, *Macræ*, Lake Superior, Rainy Lake, Lake of the Woods, *Sir J. Richardson*, (1848-9)," Boott. This plant represents in *C. canescens* the same variation that var. *cephalantha* represents in *C. echinata*. The two plants are much alike, but this is readily distinguished from *C. echinata*, var. *cephalantha*, Bailey, by the ascending and canescens-like small and marginless perigynia and the presence of scale-like bracts beneath the lower spikes. The specimens from Maine and Vermont, cited above, do not appear to have had the long and lax leaves so characteristic of the species as found farther northward and westward, and as figured by Boott. Future observation may detect varietal differences here.

Var. OREGANA.

C. Kunzei, Olney, Proc. Am. Acad. Arts and Sci. viii. 406 (1872), Excl. synonymy.

C. canescens, var. *polystachya*, Bailey, in part, Proc. Amer. Acad. Arts and Sci. xxii. 144 (1886).

Head larger and more dense than in var. *polystachya*, becoming brown; spikes loosely flowered, the perigynia sometimes

spreading in a stellate manner; perigynium narrow, often almost linear-lanceolate, brown-nerved, sharp-edged and rough above. Oregon: Portland, *Henderson*, Sauvies' Island and North Yamhill, *Howell;* Falcon valley, Washington, *Suksdorf;* Vancouver Island, *Macoun.*

CAREX VIRESCENS, Muhl.

Muhlenberg described the small form of this plant, which grows upon dry and sterile soil. The large form appears to be worth recognition:

Var. COSTATA, Dewey, Sill. Journ. (I). ix. 260 (1825).

C. costata, Schw. Ann. N. Y. Lyc. Nat. His. i. 67 (1824), v. s. Hb. Schw.

C. virescens, var. *elliptica*, Olney, Exsicc. fasc. iii. No. 21 (1872), v. s.

Tall, 1½ to 2½ ft. high, the leaves very numerous and long; spikes ranging from ½ or ¾ in. to nearly 2 in. long; perigynium more strongly ribbed than in the type. Evidently more common than the type.

CAREX GRACILLIMA × HIRSUTA.

C. hirsuta, var. *pedunculata*, Schw. & Torr. Monogr. 323 (1825), v. s. Hb. Barratt.

The plant has much the look of a slender *C. gracillima* with erect spikes, although it lacks the green color of the spikes of that species, and the perigynia are short and costate, like those of *C. triceps*, var. *hirsuta*, Bailey. Under a good magnifier the leaves disclose a little pubescence, and the perigynia show a tendency to roughness. Schweinitz and Torrey write as follows: "Spiculis oblongo-cylindricis, pedunculatis; foliis vix pubescentibus. * * This plant might be taken for a distinct species, were it not carefully examined in a living state. Its spikelets are three-fourths of an inch long, slender, and supported by peduncles half an inch in length." "In meadows, growing with *C. digitalis* [*C. gracillima*, Schw.] and the ordinary variety of *C. hirsuta*. Philipstown [Putnam Co.], Highlands of New York; rare, *Dr. Barratt.*" Not since collected.

BARRATT'S CARICES.—In 1840 Dr. Joseph Barratt prepared to publish a set of "North American Carices.". The sets appear

never to have been distributed, however. There are none of the plants in any of the large European herbaria, neither in Hb. Gray., nor Hb. Torr. In the library at Cambridge, Mass., is a set of Barratt's printed labels, but there is no record that specimens ever accompanied the labels. From the earliness of this collection, the distribution, had it taken place, would be extremely important. Request was made of Professor William North Rice, of the Wesleyan University, Middletown, Connecticut, where Barratt's collections now exist, for information concerning the carices, and he has kindly loaned me the collections since the preceding pages were in type. A set of 67 numbers is contained in a small volume, accompanied by printed labels. A printed slip indicates that the intended distribution was to contain only species growing in the vicinity of Middletown. "We have prepared fifty sets of Carices for volumes, to supply our botanical friends, and for exchanges. Great attention has been paid to note the exact period of flowering and fruiting of the Carices, in a table we have drawn up; a summary of which is here given, in latitude 41° N." The summary does not appear, unless reference is made to the record upon each label. It is interesting to note, as illustrating the extent of changes in nomenclature in our best known species, that of the 64 species and varieties only 23 bear names which are now current. In addition to the small set, there are two large fascicles containing North American species from various collectors, and with which a duplicate set of Barratt's collection is incorporated.

Dr. Barratt proposed a number of new names, which may be discussed in this connection:

C. lagopodioides, var. *nana*, is *C. tribuloides*, var. *reducta*, Bailey.

C. Pennsylvanica, var. *nebulosa*. In the separate set, this plant is a large form of *C. communis*, Bailey. In the general collection, however, the same label is applied to *C. communis*, var. *Wheeleri*, Bailey; and this latter specimen affords a new locality for this variety.

C. vesicaria, vars. *brachystachya* and *gracilis*, are rather small forms of *C. monile*, Tuckm.

C. virescens, var. *minima*. This is the small form of the

plant, but it is the one which Muhlenberg described (v. s. Hb. Willd.), and must therefore be taken as the type of the species.

C. vulpinoidea, vars. *glomerata* and *ambigua*, are both incidental variations of the species, although the former is uncommon and may merit recognition if the plant should be found to assume any degree of permanence.

The general collection contains the type of *C. hirsuta*, var. *pedunculata*, Schw. & Torr., which I had never been able to find. (See *C. gracillima* × *hirsuta* above). It also has the true *C. Novæ-Angliæ*, Schw., from Plainfield, Mass., coll. by Dr. Jacob Porter, and *C. deflexa*, var. *Deanei*, Bailey, from Essex, Mass., labelled "*C. varia.*" It is interesting to note that, in both collections, *C. varia* is represented by the true plant (*C. Emmonsii*, Dewey). Originals of Buckley's *C. Caroliniana*, *C. styloflexa*, and *C. miser* are also here. The specimen of *C. Caroliniana* is better than the one in Hb. Torr.—the only other known specimen,—although no mature perigynia remain upon it. It appears to be a good species.

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MEMOIRS

OF THE

TORREY BOTANICAL CLUB.

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Marine Algæ of the New Jersey Coast and adjacent Waters of Staten Island.

BY ISAAC C. MARTINDALE

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MARINE ALGÆ OF THE NEW JERSEY COAST AND ADJACENT WATERS OF STATEN ISLAND.

By Isaac C. Martindale, Camden, N. J.

(Read June 11, 1889).

The issue of Harvey's "Nereis Boreali Americana" in 1852–1857 by the Smithsonian Institute at Washington, was the first publication bearing on the marine algæ of the New Jersey coast; this does not show that collections were made much south of Long Branch. The fact was doubtless that up to that date very few persons indeed had collected on the more southern shores of the State. Samuel Ashmead, living at Beesley's Point, had during previous years made some study of the marine flora in his immediate vicinity, and there was published in the Report of "The Geology of the County of Cape May," issued in 1857, "A Catalogue of Marine Algæ discovered at Beesley's Point during the summer of 1855, by Samuel Ashmead, Esq." enumerating 29 species. Prof. W. G. Farlow issued in 1871–1872 a "List of the sea weeds or Marine Algæ of the south coast of New England." In 1875–1876 he also issued lists of the "Marine Algæ of the United States." In the Report of the U. S. Fish Commission for 1879, was issued "Marine Algæ of New England and adjacent coast," by Prof. Farlow; which is the best publication bearing directly on the marine flora of the New Jersey coast.

In the BULLETIN of the Torrey Botanical Club, July, 1886, Col. Nicholas Pike of Brooklyn published a "Check List of Marine Algæ, based on specimens collected on the shores of Long Island from 1839 to 1885." From time to time notes on

our marine flora have appeared in the same journal, but no attempt has been heretofore made to classify the collections on the New Jersey coast, except a bare list by A. B. Hervey in the "Preliminary Catalogue of the Flora of New Jersey," by N. L. Britton. F. S. Collins contributed to the December, 1888, No. of the BULLETIN an account of "Algæ from Atlantic City N. J. collected by S. R. Morse," giving a list of the species obtained from 1884 to 1888 inclusive.

The following list is based on the notes and collections of the writer, made during the past twenty years. Besides which Col. Pike has kindly furnished a list of "Algæ observed by Nicholas Pike on the New Jersey coast and collected by him between the years 1840 and 1886." Also a "List of the Marine Flora of Staten Island," prepared by himself. None of the specimens collected by him have been seen by me and are here given entirely on the authority stated. Prof. S. R. Morse of Atlantic City has collected very extensively in the waters of that section. The late Prof. Rachel L. Bodley of Philadelphia published some sketches in the columns of the "Public Ledger" of Philadelphia, on the collections made while spending a holiday season at Longport, six miles below Atlantic City. The first collections made at that place were by Mrs. H. M. Lawton, and Mrs. E. H. McCullough, who have proved themselves to be experts in the mounting of specimens, a number of which have been made into "souvenirs of Longport," and sold in the bazaars of Atlantic City and elsewhere. Miss A. R. Murphy of Germantown, Pa., subsequently collected quite extensively there, also at Atlantic City, and has been fortunate in obtaining some of the finest specimens yet seen on the coast. Miss Carrie A. Boice made a collection at Ocean Grove; Mrs. Nancy J. Gardner at Asbury Park; and Mrs. Lucy H. Porter, M.D., of Philadelphia, has made quite an extensive collection at Somer's Point and at Atlantic City. The late Halliday Jackson of West Chester, Pa., collected a few specimens at Cape May and other points of the coast. Dr. N. L. Britton has made considerable collections at Staten Island and about New York harbor; a number of other persons have from time to time added to the knowledge of our sea coast flora by their contributions. This list embraces 91 genera, 183 species and 41 varieties.

Nearly the whole of those collected in the waters about Atlantic City have been identified or examined either by Prof. Farlow or Frank S. Collins of Malden, Mass. The latter spent a few days at that point examining the collections of Prof. Morse, aud studying the finer forms found at the Inlet and Thoroughfare. The writer is greatly indebted to him for his generous and kindly aid, always furnished whenever called upon, and without which this list could not have been made as complete as it now is. The Geological Survey of New Jersey is to be congratulated that the valuable services of this eminent algologist have been thus obtained.

Among the microscopic forms of Marine Algæ some species may yet be detected on our shores, but the list embraces all the species known or said to have been collected on our coast. The herbarium of the Academy of Natural Sciences of Philadelphia has been examined in the preparation of this list; and the writer desires to return his sincere thanks to the numerous persons who have kindly allowed him to examine their collections, and to express the hope that this publication may be the means of awakening an interest in, or an incentive to a closer study of our flora by many of the thousands who spend some portion of the year at the numerous sea-side resorts of our State.

CRYPTOPHYCEÆ.

CHROOCOCCUS, Næg.

C. TURGIDUS, Næg. "Pier at Stapleton, S. I.; on rocks in brook near Silver Lake. Spring and summer." *Pike.*

XENOCOCCUS, Thuret.

X. SCHOUSBŒI, Thuret. Growing on *Lyngbya luteo-fusca.* Atlantic City, *Martindale.* Mr. Collins says, "this is the first time it has been reported on this coast."

GLŒOCAPSA (Kütz), Næg.

G. CREPIDINUM, Thuret.

On wharves, Atlantic City, *Morse, Martindale;* Staten Island, *Pike.*

ENTOPHYSALIS, Kütz.

E. GRANULOSA, Kütz. On old shells, Atlantic City, *Morse;* Mr. Collins says "not previously reported on the American coast."

POLYCYSTIS, Kütz.

P. PALLIDA, Kütz.

On decaying algæ. Atlantic City, *Morse.*

P. ELABENS, Kütz. "Prince's Bay, Staten Island," *Pike.*

CLATHROCYSTIS, Henfrey.

C. ROSEA-PERSICINA, Cohn.

On mud and small pebbles, Atlantic City, *Morse, Martindale;* Staten Island, *Pike.* It has occasionally been seen on fish in the Philadelphia market, which were said to have been caught on the New Jersey coast.

SPIRULINA, TURPIN.

S. TENUISSIMA, Kütz. Atlantic City, mixed with *Oscillaria,* etc., *Morse;* Swimming River, Monmouth Co., *Britton;* Staten Island, *Pike.*

BEGGIATOA, Trev.

B. ALBA, Trev.

Var. MARINA, Warming. On leaves and stems of *Spartina,* in brackish ditches, Atlantic City, *Martindale;* Staten Island, *Pike.*

B. ARACHNOIDEA, Rab.

With the former, Atlantic City, *Martindale.*

LEPTOTHRIX, Kütz.

L. RIGIDULA, Kütz. Growing on other algæ, Atlantic City, *Morse, Martindale.*

OSCILLARIA, Kütz.

O. SUBULIFORMIS, Harv. In brackish ditches and pools, Atlantic City, *Morse, Martindale;* Staten Island, *Pike.*

O. SUBTORULOSA (Brèb.), Farlow.

With the former, Atlantic City, *Morse, Martindale.*

O. LIMOSA, Kütz, var. CHALYBEA, Kütz. "Stapleton and Tompkinsville, Staten Island," *Pike.*

MICROCOLEUS, Desmaz.

M. CHTHONOPLASTES, (Fl. Dan.), Thuret. In brackish pools, Atlantic City, *Morse, Martindale.*

LYNGBYA, Ag.

L. MAJUSCULA (Dillw.), Harv. Cape Cod to Key West, common, *Farlow* in Mar. Alg. New England; Newark Bay, *Pike;*

Cape May, *Martindale.* On stems of floating *Zostera*, Atlantic City, *Morse.*

L. ÆSTUARII (Jürg.), Liebm. Salt ditches at Hoboken, *Prof. Bailey* in Ner. Bor. Am.; Perth Amboy, *F. Wolle;* on floating *Zostera*, Atlantic City, *Morse;* salt ditches, Cape May, *Martindale;* common in salt ponds and marshes, Newark Bay, *Pike.*

L. LUTEO-FUSCA (Ag.), J. Ag. Hoboken and Staten Island, *Pike.* On wharves between tide marks, Atlantic City, *Martindale, Morse.*

L. TENERRIMA, Thuret. On wharves, Atlantic City, *Morse.*

L. NIGRESCENS, Harv. "Prince's Bay, Staten Island," *Pike.*

CALOTHRIX, Ag.

C. CONFERVICOLA (Roth), Ag. New York Bay, *J. Hooper* in "Introduction to Algology, with a catalogue of American Algæ," Brooklyn, 1850; Hoboken, Communipaw, Staten Island, *Pike.* On stems of *Fucus vesciculosus*, Atlantic City, *Morse, Martindale.*

C. CRUSTACEA (Schousb.), Born. and Thur. On stems of *Fucus, Morse, Martindale.*

C. SCOPULORUM (Web. and Mohr), Ag. Hoboken, Staten Island and Beesley's Point, *Pike;* on wharves, Atlantic City, *Morse, Martindale.*

C. PULVINATA (Mert.), Ag. On wharves, Atlantic City, *Morse, Martindale.*

RIVULARIA (Roth), Ag.

R. ATRA, Roth. On stones, Atlantic City, *Martindale.*

R. POLYOTIS (J. Ag.), Bornet and Flahault. (*R. hospita*, Thuret.) On exposed roots of *Spartina*, Atlantic City, *Morse.*

R. NITIDA, Ag. (*R. plicata*, Carm.), "Prince's Bay, Staten Island," *Pike.*

ISACTIS, Thuret.

I. PLANA (Harv.), Thuret. On stones and old oyster shells, Atlantic City, *Morse, Martindale.*

BRACHYTRICHIA, Zau.

B. QUOYI (Ag.), Bornet and Flahault, (*Hormactics Quoyi*, Ag.). A specimen thought to be of this species was collected at Atlantic City, *Morse.*

ANABÆNA, Bory.

A. TORULOSA (Carm.), Lagerheim, (*Sphærozyga Carmichælii*, Harv.). Camden, *H. C. Wood, Jr.* in Fresh Water Algæ of America; on decaying algæ, Atlantic City, *Morse, Martindale;* Newark Bay, *Pike.*

NODULARIA, Mertens.

N. HARVEYANA, Thuret. "Mariners' Harbor, Staten Island," *Pike.*

ZOOSPOREÆ.

MONOSTROMA (Thuret), Wittr.

M. BLYTII (Aresch.), Wittr. A specimen thought to be of this species was collected on woodwork exposed to the waves, Atlantic City, *Morse.*

M. CREPIDINUM, Farlow. On wharf pilings, Atlantic City, *Morse.*

M. GREVILLEI (Thuret), Wittr. "Prince's Bay, Staten Island," *Pike.*

M. PULCHRUM, Farlow. "Common all around Staten Island," *Pike.*

ULVA (L.), Le Jolis.

U. LACTUCA (L.), Le Jolis. Common in bays along the whole coast.

Var. RIGIDA (Ag.), Le Jolis. Atlantic City, *Martindale, Morse;* Staten Island, *Pike.*

Var. LACTUCA, Le Jolis. Atlantic City, *Martindale, Morse;* Longport, *Mrs. Lawton;* Staten Island, *Pike.*

Var. LATISSIMA, Le Jolis. Common, Beesley's Point, *Ashmead,* and in bays along the whole coast. At Longport the fronds are often of unusual size; three feet long and fully as wide.

U. ENTEROMORPHA, Le Jolis. Common in bays along the whole coast, in a great variety of forms.

Var. LANCEOLATA, Le Jolis. Atlantic City, *Morse, Martindale, Miss A. R. Murphy;* Longport, *Lawton;* Staten Island, *Pike.*

Var. INTESTINALIS, Le Jolis. Asbury Park, *Mrs. N. T. Gardner;* Atlantic City, *Morse, Martindale, Murphy;* Longport, *Lawton, Mrs. E. H. McCullough;* abundant

in Little Bay, *Ashmead;* Beesley's Point, *Ashmead, Harvey;* Somer's Point, *Mrs. L. H. Porter;* Cape May, *Martindale.*

Var. COMPRESSA, Le Jolis. With the last named variety and equally abundant, growing on shells, stones and wood, between tide-marks.

U. MARGINATA (J. Ag.), Le Jolis. Atlantic City, *Morse,* on wharf between tide-marks.

U. AUREOLA, Ag. Atlantic City, *Morse, Collins.*

U. PERCURSA, Ag. Atlantic City, *Morse, Martindale,* on wharves, between tide-marks.

U. CLATHRATA, Ag. Beesley's Point, *Ashmead, Harvey;* Atlantic City, *Morse, Martindale;* Ocean Grove, *Miss Carrie A. Boice;* Longport, *Lawton;* New York Bay, *Pike.*

Var. UNCINATA, Le Jolis. Atlantic City, *Morse, Martindale.*

Var. ERECTA, Le Jolis. Atlantic City, *Morse, Martindale.*

Var. PROSTRATA, Le Jolis. Atlantic City, *Morse, Martindale.*

Var. CRINITA, Hauck. (*Enteromorpha crinita,* J. Ag.). Atlantic City, *Martindale.*

All these varieties grow on shells and stones between tide-marks.

U. HOPKIRKII (McCalla), Harv. Staten Island, *Pike;* Atlantic City, on old shells, *Morse, Martindale.*

ULOTHRIX (Kütz.), Thur.

U. FLACCA (Dillw.), Thur. On wharves, Atlantic City, *Martindale, Morse.*

U. ISOGONA (Engl. Bot.), Thuret. New York Bay, *Harvey;* Common at Fort Hamilton in spring, *Harvey;* on wharves, Atlantic City, *Morse, Martindale;* Staten Island, *Pike.*

Mr. Morse collected at Atlantic City a very slender form, which Mr. Collins states may possibly be distinct from either of these species.

CHÆTOMORPHA, Kütz.

C. ÆREA (Dillw.), Kütz. New York Bay, *Hooper,* in Harvey Ner. Bor. Am.; common at Beesley's Point, *Pike.*

C. PICQUOTIANA (Mont.), Kütz. Staten Island, *Torrey* in

Harvey, Ner. Bor. Am.; Communipaw, Prince's Bay, S. I. and Long Branch, *Pike;* washed ashore at Atlantic City, *Martindale, Murphy.*

C. LINUM (Flor. Dan.), Kütz. Staten Island, *Pike;* Atlantic City, *Martindale, Morse;* washed ashore at Longport, *McCullough;* at Beesley's Point, *Ashmead.* In the summer of 1887 I collected at Somer's Point a form with unusually large fronds, which must be of this species although the cells were very much larger than common. Intermediate forms also occur.

C. MELAGONIUM (Web. and Mohr), Kütz. Atlantic City, *Morse, fide Collins.* A slender short-jointed form, probably due to the locality being at the extreme southern range of this species.

RHIZOCLONIUM, Kütz.

R. SALINUM (Schleich.), Kütz. (*R. riparium,* Roth.). On exposed *Spartina* roots, Atlantic City, *Martindale, Morse.*

R. KOCHIANUM, Kütz. On *Zostera,* Atlantic City, *Martindale;* Somer's Point, *Porter.*

R. TORTUOSUM, Kütz. "Prince's Bay, S. I.," *Pike.*

CLADOPHORA, Kütz.

C. ARCTA (Dillw.), Kütz. New York Bay, *Walters,* in Harv. Ner. Bor. Am.; common on south shore of Staten Island, *Pike.*

C. LANOSA (Roth.), Kütz. "Prince's Bay, S. I.," *Pike.*

C. RUPESTRIS, Kütz. "Communipaw and Prince's Bay, S. I.," *Pike.*

C. ALBIDA (Huds.), Kütz. Staten Island, New York Bay, Beesley's Point, Cape May, *Harvey,* Ner. Bor. Am.; Communipaw, *Pike;* Atlantic City, *Morse.*

C. REFRACTA (Roth), Aresch. New York, *Harvey,* Ner. Bor. Am.; South Beach, S. I., *Britton;* Atlantic City, *Morse;* floating in the bay at Longport, *Lawton;* Newark Bay, *Pike.*

C. GLAUCESCENS (Griff.), Harv. New York Bay, *Harvey,* Ner. Bor. Am.; Beesley's Point, *Ashmead;* Atlantic City, *Morse;* Staten Island, *Pike.*

C. LÆTEVIRENS (Dillw.), Harv. New York Bay, *Harvey,*

Ner. Bor. Am ; Communipaw, Staten Island, Beesley's Point, *Pike.*

C. HUTCHINSIÆ (Dillw.), Kütz. In tide pools, Atlantic City, *Morse, Martindale, Murphy;* Longport, *McCullough, Lawton, Miss Jennie Hood.*

C. FLEXUOSA (Griff.), Harv. In tide pools, Atlantic City, *Martindale, Morse* ; Longport, *Lawton.*

C. MORRISIÆ, Harv. Elsinborough, Delaware, *Miss Morris,* in Harvey, Ner. Bor. Am. This may be a typographical error, as there is an Elsinborough in Salem Co. N. J.

C. RUDOLPHIANA (Ag.), Harv. Communipaw and Pleasure Bay, and Prince's Bay, S. I., *Pike.*

C. GRACILIS (Griff.), Kütz. Beesley's Point, *Ashmead*; New York Bay, *J. Hooper*; brackish pond at New Dorp, Staten Island, *Britton*; Atlantic City, *Morse, Martindale, Murphy*; Longport, *Lawton* ; Asbury Park, *Gardner.*

Var. EXPANSA, Farlow. Atlantic City, *Morse.*

C. EXPANSA, Kütz. In brackish pools, Atlantic City, *Morse, Martindale*; Longport, *McCullough.*

C. FRACTA (Fl. Dan.), Kütz. New York, *Harvey*; in the Hudson, near West Point, *Bailey*; Beesley's Point, *Ashmead*; Atlantic City, *Morse*; floating at Key East, *Gardner*; Staten Island, *Pike.*

C. FALCATA, Harv. "Occurs plentiful in Little Bay, Cape May Co.," *Ashmead.* This may be only *C. gracilis.*

A quantity of the new genus *Acroblaste*, Reinsch, Farlow, Mar. Alg. New Eng., p. 57, the species not determined, has been collected at Atlantic City, *Morse, Martindale.*

BRYOPSIS, Lamourx.

B. PLUMOSA (Huds.), Ag. Attached to old shells and other submerged substances on the shores of Great Egg Harbor Bay, *Ashmead;* New York Bay, *Chamberlin;* Staten Island, *Torrey Herb.;* common near New York, *Harvey, Pike;* in muddy ditches, Atlantic City, *Morse, Martindale;* Longport, *Murphy, Martindale, Miss Hood.*

B. HYPNOIDES, Lamourx. "On the ferry bridge, Jersey City, just below the water line, 1850," *Pike.* Not otherwise known in our waters.

DERBESIA, Sol.

D. TENUISSIMA (De Not.), Crouan. South shore of Staten Island, *Britton, Pike.*

PHYLLITIS (Kütz.), Le Jolis.

P. FASCIA (Fl. Dan.), Kütz. Fort Hamilton, New York Harbor, *Pike* in Harvey Ner. Bor. Am.; also collected by *Col. Pike* at Long Branch; Atlantic City, *Morse, Martindale;* Longport, *Lawton.*

Var. CÆSPITOSA. Atlantic City, *Morse, Martindale.*

SCYTOSIPHON (Ag.), Thur.

S. LOMENTARIUS (Lyngb.), J. Ag. British America to Charleston, S. C., *Harvey;* on stones between tide-marks, Atlantic City, *Morse;* Staten Island, *Pike.*

PUNCTARIA, Grev.

P. LATIFOLIA, Grev. Fort Hamilton, New York, *Harvey;* Perth Amboy, *Harvey, Britton;* Atlantic City, *Morse, Martindale;* Staten Island, *Pike.*

Var. ZOSTERÆ, Le Jol. Fort Hamilton, N. Y., *Harvey, Pike;* Communipaw, *Pike;* Atlantic City, *Morse, Martindale;* Longport, *Lawton.*

P. PLANTAGINEA (Roth), Grev. On piling between tide-marks, Atlantic City, *Morse, Martindale.*

DESMARESTIA, Lamourx.

D. ACULEATA (L.), Lamourx. Communipaw, Staten Island and Beesley's Point, *Pike.*

D. VIRIDIS (Fl. Dan.), Lamourx. New York Bay, *J. Hooper;* common in Prince's Bay, Staten Island, Pleasant Bay and at Sandy Hook, *Pike.*

DICTYOSIPHON, Grev.

D. FŒNICULACEUS (Huds.), Grev. On stones and on other algæ near low water mark, Atlantic City, *Morse;* Longport, *Lawton;* New York Bay, *J. Hooper;* common at Prince's Bay, Staten Island, *Pike.* Variable, some forms approaching var. *flaccidus*, Aresch., were collected at Atlantic City, *Morse.*

MYRIOTRICHIA, Harv.

M. CLAVÆFORMIS, Harv. Communipaw, Staten Island and Pleasure Bay, *Pike;* on *Zostera*, Atlantic City, *Martindale, Morse;* Longport, *Martindale, McCullough.*

Var. FILIFORMIS, Farlow. With the type.

ECTOCARPUS, Lyngb.

E. TOMENTOSUS (Huds), Lyngb. Atlantic City, *Morse.*

E. GRANULOSUS (Eng. Bot.), Ag. Atlantic City, on an old mast, *Morse.*

Var. TENUIS, Farlow. Atlantic City, *Martindale.*

E. CONFERVOIDES (Roth), Le Jolis. Occurs sparingly on shores of Little Bay, on rockweed, *Ashmead;* New York Bay, *Hooper;* south shore of Staten Island, *Britton, Pike;* Atlantic City, *Morse, Martindale;* Longport, *Murphy, McCullough, Dr. Porter.*

Var. SILICULOSUS, Kjellman. Common in the bays on *Zostera,* disappearing in July, Beesley's Point, *Ashmead;* on *Spartina* roots in tide pools, Atlantic City, *Martindale, Morse;* Ocean Grove, *Boice;* Longport, *Lawton.*

E. FASCICULATUS, Harv. Communipaw, Prince's Bay, Staten Island and Perth Amboy, *Pike.*

E. LUTOSUS, Harv. Staten Island and Pleasure Bay, *Pike.*

E. LITTORALIS, Lyngb. Abundant in the bays of Egg Harbor, *Ashmead;* south shore of Staten Island, *Britton, Pike;* Atlantic City, *Morse, Martindale, Murphy;* on wood work exposed to the waves, Longport, *Martindale, Lawton.*

Var. RAMELLOSUS, Hauck. Atlantic City, *Collins, Morse.*

E. TERMINALIS, Kütz. Atlantic City, *Martindale, Morse.*

SPHACELARIA, Lyngb.

S. CIRRHOSA (Roth), Ag. Shore of Staten Island, on *Cystoclonium, Britton;* also reported by *Pike.*

CLADOSTEPHUS, Ag.

C. VERTICILLATUS (Lightf.), Ag. Staten Island, *Pike.*

MYRIONEMA, Grev.

M. VULGARE, Thur. Common on various algæ and occasionally found on stones along the entire New Jersey coast, *Pike;* on *Ulva,* Atlantic City, *Martindale, Morse.*

ELACHISTEA, Duby.

E. FUCICOLA (Velley), Fries. Common along Staten Island, *Pike;* on *Fucus,* Atlantic City, *Morse, Martindale;* Longport, *Martindale, McCullough.*

LEATHESIA, S. F. Gray.

L. DIFFORMIS (L.), Aresch. Staten Island, *Pike;* on wood work at low water mark, Atlantic City, *Morse, Martindale;* sometimes on other algæ, Longport, *Lawton, McCullough.*

CHORDARIA, Ag.

C. FLAGELLIFORMIS (Fl. Dan.), Ag. Staten Island, *Harvey* Ner. Bor. Am., *Pike;* Atlantic City, *Morse.*

MESOGLOIA, Ag.

M. DIVARICATA (Ag.), Kütz. Very common from Cape Cod southward, *Farlow;* New York Bay, *Hooper;* Pleasure Bay, *Pike.*

CASTAGNEA (Dub. and Sol.), Thur.

C. VIRESCENS (Carm.), Thur. A specimen of this species is said to have been collected on the beach at Long Branch; if so, it must have been washed in by the waves from the coast of New England.

RALFSIA, Berkeley.

R. VERRUCOSA (Aresch), J. Ag. On old shells, Atlantic City, *Martindale, Porter.*

R. CLAVATA (Carm.), Crouan. Atlantic City, *Morse, Martindale;* Longport, *Martindale;* Somer's Point, *Porter.*

ASPEROCOCCUS, Lamourx.

A. ECHINATUS (Mert.), Grev. "All around Staten Island." *Pike.*

STILOPHORA, J. Ag.

S. RHIZODES, Ag. Egg Harbor, rather rare on old shells, near low water mark, *Ashmead;* Staten Island, *Pike.*

S. PAPILLOSA, J. Ag. "Great Egg Harbor Bay and Pleasure Bay," *Pike.* Not otherwise known on our coast; possibly only a form of the former species.

STRIARIA, Grev.

S. ATTENUATA, Grev. "Prince's Bay, S. I.," *Pike.* See Farlow, Mar. Alg. p. 90.

CHORDA, Stack.

C. FILUM (L.), Stack. Perth Amboy, *Hervey, Britton;* Ocean Beach, *C. Henry Kain.*

LAMINARIA, Lamourx.

L. SACCHARINA (L.), Lamourx. "Cast up from deep water on

the New Jersey coast, its southern limit not ascertained below Long Branch," *Harvey;* on the beach at Asbury Park in great abundance in 1887, *N. T. Gardner;* Atlantic City, *Morse;* and occasionally at Longport, *Martindale;* New Dorp, S. I., *Britton.*

L. DIGITATA (L.), Lamourx. "Prince's Bay, S. I.," *Pike.*

ALARIA, Grev.

A. ESCULENTA, Grev. "Found only once at Prince's Bay, S. I., probably washed from Montauk Point, much decomposed, end of summer," *Pike.*

OOSPOREÆ.

ASCOPHYLLUM (Stack), Le Jolis.

A. NODOSUM (L.), Le Jolis, (*Fucus nodosus*, L.). New York Bay, shores of Staten Island, *Pike;* Atlantic City, *Morse, Martindale;* Longport, washed up in great abundance in 1887, *Martindale;* sparingly in 1888, *McCullough;* Sandy Hook, *Britton.*

FUCUS (L.), Decne. & Thur.

F. VESICULOSUS, L. Common on the whole coast; the fronds very variable.

Var. LATERIFRUCTUS, Grev. With the type.

Var. SPIRALIS. With the type.

F. EDENTATUS, De La Pylaie? (*F. evanescens* of Farlow Marine Algæ N. E.) Atlantic City, *Morse, Collins.*

F. CERANOIDES, L. "Sailors' Snug Harbor, S. I.," *Pike.*

SARGASSUM, Ag.

S. VULGARE, Ag., frequently washed ashore along the entire coast.

Var. MONTAGNEI, Atlantic City, *Martindale, Morse;* quite abundant at Longport in 1887, *McCullough, Porter, Martindale;* also at Somer's Point, *Porter.*

S. BACCIFERUM (Turn.), Ag. Frequently washed ashore, Atlantic City, *Martindale;* Longport, *McCullough, Bodley.*

VAUCHERIA, D.C.

V. THURETII, Woronin. Muddy ditches, Atlantic City, *Morse.*

V. LITOREA (Hoffman), Bang. On gravel stones, Atlantic City, *Morse, Martindale.*

FLORIDEÆ.

TRENTEPOHLIA (Ag.), Prings.

T. VIRGATULA (Harv.), Farlow. On other algæ and on *Zostera*, Atlantic City, *Morse, Martindale;* Longport, *Lawton.*

T. DAVIESII (Dillw.), Harv. On *Chætomorpha Melagonium*, Atlantic City, *Morse, fide Collins.*

PORPHYRA, Ag.

P. LACINIATA (Lightf.), Ag. (*P. vulgaris, Harv.*). Common along the shores of New York Bay and Harbor. On *Zostera* in Little Bay, Egg Harbor, very rare, *Ashmead;* Atlantic City, *Morse, Martindale;* Longport, *Lawton, McCullough, Martindale.*

P. LEUCOSTICTA, Thur. Atlantic City, *Morse*, vide F. S. Collins in Bull. Torrey Bot. Club, xi. 132; Longport, *Lawton, McCullough, Martindale.*

BANGIA, Lyngb.

B. FUSCO-PURPUREA (Dillw.), Lyngb. On wharves, Atlantic City, *Morse, Martindale, Murphy;* Staten Island and Pleasure Bay, *Pike.*

ERYTHROTRICHIA, Aresch.

E. CERAMICOLA (Lyngb.), Aresch. Atlantic City, *Morse, Martindale, Murphy;* Longport, *Martindale, McCullough.*

E. CILIARIS (Carm.), Thuret. In company with *Trentepohlia Daviesii*, Atlantic City, *Morse, fide Collins.* Has not been previously reported on the coast from any point north of South Carolina.

GONIOTRICHUM, Kütz.

G. ELEGANS (Chauv.), Zanard. Atlantic City, *Morse*, mixed with *Bangia;* detected by F. S. Collins.

HILDENBRANDTIA, Nardo.

H. ROSEA, Kütz. "Very common on stones from Hoboken to Sandy Hook, *Pike.*"

SPERMOTHAMNION, Aresch.

S. TURNERI (Mert.), Aresch. "Communipaw and Staten Island," *Pike.*

CALLITHAMNION, Lyngb.*

*C. ROTHII (Engl. Bot.), Lyngb. Common from New York northward, *Farlow* in Mar. Algæ New Eng., but so far as I know has not definitely been detected in New Jersey waters.

C. CRUCIATUM, Ag. Red Hook, New York, *Harvey* Ner. Bor. Am.; Communipaw and Staten Island, *Pike;* Atlantic City, *Morse, Martindale;* Longport, *Lawton, McCullough, Murphy, Martindale.* The rare cystocarpic fruit is quite common at Atlantic City, *Collins.*

C. AMERICANUM, Harv. From New Jersey northward, *Farlow;* on the New Jersey Flats and on Staten Island, *Pike;* Atlantic City, *Morse, Martindale.*

C. PLUMULA (Ellis), Lyngb. Long Branch, *Miss E. C. Morris* in Harvey Ner. Bor. Am.; Staten Island and Communipaw, *Pike;* Atlantic City, *Morse.*

C. BORRERI (Engl. Bot.), Harv. New York, *Harvey;* very common at Sailors' Snug Harbor, Staten Island and Communipaw, *Pike;* Atlantic City, *Morse, Martindale, Porter, Murphy;* Longport, *Lawton, McCullough, Miss J. Hood, Martindale, Murphy;* Somer's Point, *Porter;* Cape May, *Halliday Jackson, Martindale.*

C. ROSEUM (Roth), Harvey. New York Harbor, *A. R. Young* in Farlow Marine Algæ New Eng; Prince's Bay, Staten Island, and Pleasure Bay, *Pike;* Atlantic City, *Morse, Collins, Martindale.*

C. POLYSPERMUM, Ag. Rare on old shells in Great Egg Harbor Bay, *Ashmead;* Staten Island and Communipaw, *Pike.*

C. TETRAGONUM (With.), Ag. Fort Hamilton and Red Hook, New York Bay, and it probably grows on the New Jersey shore, *Pike.*

C. BAILEYI, Harv. Common from New Jersey to Cape Cod, *Farlow;* New Brighton, S. I. and abundant in New York Bay, *Harvey;* common at Staten Island, *Pike.*

C. BYSSOIDEUM, Arn. New York Harbor, *Harvey;* Port Richmond and New Brighton S. I., *B. B. Chamberlain, Pike;* frequent on *Zostera* and attached to old shells in Great Egg Harbor Bay, *Ashmead;* Atlantic City, *Martindale, Morse, Murphy;* Jersey City and Hoboken, *H. Jackson;* Longport, *Lawton, McCullough, Martindale, Murphy;* Somer's Point, *Porter;* Cape May, *Martindale.* The forms

of this species are numerous, but the definite varieties have not been separated.

C. CORYMBOSUM (Engl. Bot.), Lyngb. "Communipaw and Staten Island," *Pike.*

C. DIETZIÆ, Hooper. "Communipaw and Staten Island," *Pike.* This may be incorrectly determined, see Farlow's Manual, page 9.

C? TENUE (Ag.), Harv. Beesley's Point, Cape May Co., *Ashmead* in Harvey Ner. Bor. Am.; Pleasure Bay, Communipaw, and at Stapleton, *Pike;* Atlantic City, *Morse, Martindale;* Longport, *Lawton, McCullough;* Somer's Point, *Dr. Porter.* All the specimens found thus far are sterile, so that the true genus still remains unsettled.

GRIFFITHSIA, Ag.

G. BORNETIANA, Farlow. Communipaw, Staten Island and Pleasure Bay, *Pike.*

HALURUS, Kütz.

H. EQUISETIFOLIUS, Kütz. "New Jersey coast near New York," *Pike.* According to Farlow's Manual this must be very doubtful.

PTILOTA, Ag.

P. ELEGANS, Bonnem. Squan Beach, N. J., *Miss Morris* in Harvey, Ner. Bor. Am.; Sandy Hook, *Pike;* very large specimens at Sea Bright, 1883, *H. Averill;* Ocean Grove, *C. A. Boice;* Asbury Park, *Louisa Emily Knight;* Atlantic City, *Morse, Martindale;* Longport, *Lawton, McCullough.*

P. PECTINATA (Gunnar), Kjellman. (*P. serrata*, Kütz.) Asbury Park, *Louisa Emily Knight*, 1886. The only specimen so far as known coming from N. J. waters.

CERAMIUM, Lyngb.

C. RUBRUM (Huds.), Ag. Cape Cod to Charleston, *Harvey;* New York harbor, *H. Jackson, N. Pike;* abundant on *Zostera* and quite variable, Beesley's Point, *Ashmead;* Atlantic City, *Morse, Martindale, Murphy, Porter;* abundant on south shore of Staten Island, *Britton;* Ocean Grove, *C. A. Boice;* Somer's Point, *Porter;* Longport, *Lawton, McCullough, Martindale, Murphy.*

Var. PROLIFERUM, J. Ag. Asbury Park, *N. T. Gardner;* Atlantic City, *Martindale.*

Var. SECUNDATUM, Ag. Atlantic City, *Martindale.*

Var. SQUARROSUM, Harv. Atlantic City, *Martindale.*

C. CIRCINNATUM, Kütz. "Prince's Bay, S. I., Aug. and Sept." *Pike.*

C. DIAPHANUM (Lightf.), Roth. Sparingly, Beesley's Point, *Ashmead;* Atlantic City, *Morse, Martindale;* Longport, *Lawton, McCullough, Murphy.*

C. STRICTUM (Kütz.), Harv. Common from New York to Cape Cod, *Farlow*, Mar. Alg. New Eng.; Communipaw and Pleasure Bay, *Pike;* Asbury Park, *C. H. Kain;* Ocean Grove, *C. A. Boice;* Atlantic City, *Morse, Martindale, Murphy, Porter;* Longport, *Lawton, McCullough, Martindale;* Somer's Point, *Porter;* Cape May, *H. Jackson.*

C. FASTIGIATUM, Harv. New York Bay, *Chamberlin, Pike;* Long Branch, *Miss Morris* in Harvey Ner. Bor. Am.; in dense tufts on *Zostera*, rather rare, Beesley's Point, *Ashmead;* Atlantic City, *Morse, Martindale;* Asbury Park, *N. T. Gardner;* Somer's Point, on *Rhabdonia, Martindale, Porter.*

C. TENUISSIMUM (Lyngb.), J. Ag. Staten Island, *Pike;* Ocean Grove, *C. H. Kain, C. A. Boice;* Asbury Park, *N. T. Gardner;* Atlantic City, *Morse, Martindale;* Longport, *Lawton, McCullough, Martindale.*

Var. ARACHNOIDEUM, J. Ag. Atlantic City, *Martindale.*

Var. PATENTISSIMUM, Harv. Atlantic City, *Morse, Martindale.*

SPYRIDIA, Harv.

S. FILAMENTOSA (Wulf.), Harv. Common from Cape Cod southward, *Farlow;* abundant in bays at Egg Harbor, *Ashmead;* Staten Island and Communipaw, *Pike;* Atlantic City, *Morse, Martindale;* Longport, *Martindale, McCullough.*

PHYLLOPHORA, Grev.

P. BRODIÆI (Turn.), J. Ag. Communipaw and Prince's Bay, *Pike;* Asbury Park, *N. T. Gardner;* Atlantic City, *Morse, Martindale.*

P. MEMBRANIFOLIA (Good. & Woodw.), J. Ag. New York, *Hooper, Calverly* in Harvey Ner. Bor. Am.; Long Branch, *Miss Morris* in same; Staten Island and Pleasure Bay, *Pike;* Asbury Park and Ocean Beach, *N. T. Gardner;* Ocean Grove, *C. A. Boice;* Atlantic City, *Morse, Martindale.*

GYMNOGONGRUS, Mart.

G. TORREYI (Ag.), J. Ag. New York, *Prof. Agardh;* Staten Island, *Pike.*

AHNFELDTIA, Fries.

A. PLICATA (Huds.), Fries. New York, *Calverly* in Harvey Ner. Bor. Am.; Staten Island and Sandy Hook, washed ashore, *Pike.*

CYSTOCLONIUM, Kütz.

C. PURPURASCENS (Huds.), Kütz. Squan, *Miss E. Morris* in Harvey Ner. Bor. Am.; New York Bay, *J. Hooper;* abundant on south shore of Staten Island, *Britton;* Atlantic City, *Morse, Martindale.*

Var. CIRRHOSA, Harv. Ocean Grove, *C. A. Boice.*

GIGARTINA, Lamourx.

G. MAMILLOSA (Good. & Woodw.), J. Ag. "Prince's Bay, S. I.," *Pike.*

CHONDRUS, Stack.

C. CRISPUS (L.), Stack. Collected at Staten Island in 1860 by *John Hooper*, according to Col. N. Pike; Atlantic City, *Morse.*

RHODYMENIA (Grev.), J. Ag.

R. PALMATA (L.), Grev. On *Laminaria* at Long Branch, *Pike;* Atlantic City, *Morse.*

EUTHORA, J. Ag.

E. CRISTATA, J. Ag. Staten Island, *Farlow*, Marine Alg. New Eng.; Prince's Bay, S. I., *Pike;* Long Branch, *J. Walters, J. Hooper.*

LOMENTARIA (Gaill.), Thuret.

L. UNCINATA, Menegh. Common from Cape Cod southward, *Farlow;* Staten Island, *Pike;* frequent on *Zostera* and *Ulva*, Beesley's Point, *Ashmead;* Somer's Point, *Porter, Martindale;* Atlantic City, *Morse, Martindale, Murphy;* Longport, *Lawton, Murphy, McCullough.*

Var. FILIFORMIS, Harv. Atlantic City, *Morse, Martindale;* Longport, *Lawton, McCullough, Martindale,* and an extreme form, possibly var. *robusta,* Harvey.

Var. VALIDA (Harv.) Longport, *Martindale.*

L. ROSEA (Harv.), Thuret. "Stapleton, S. I.," *Pike.*

CHAMPIA, Ag.

C. PARVULA (Ag.), Harv. Common from Cape Cod southward, *Farlow;* plentiful in Little Bay, *Ashmead;* Staten Island, *Pike;* Asbury Park, *Gardner;* Ocean Grove, *C. A. Boice, C. H. Kain;* Atlantic City, *Morse, Martindale, Murphy, Porter;* Longport, *Lawton, McCullough, Martindale, Murphy;* Somer's Point, *Porter, Martindale.*

HYPNEA, Lamourx.

H. MUSCIFORMIS (Wulf.), Lamourx. Sandy Hook, *Pike;* washed ashore, Atlantic City, *Murphy;* Longport, *Lawton.*

GELIDIUM, Lamourx.

G. CRINALE (Turn.), J. Ag. Red Hook, N. Y., *Harvey;* on old shells in Little Bay, Egg Harbor, *Ashmead;* New York Bay, *J. Hooper;* Communipaw, *J. Walters, Pike;* on piling below high water, Atlantic City, *Morse, Martindale;* Somer's Point, *Martindale, Porter.*

RHABDONIA, Harv.

R. TENERA, Ag. Common on shores of Staten Island, *Chamberlin;* Long Branch, *Miss Morris* in Harvey Ner. Bor. Am.; very common on shores at Egg Harbor Bay, *Ashmead;* Somer's Point, *Porter;* Atlantic City, *Morse, Martindale, Murphy;* Longport, *Lawton, McCullough, Murphy, Martindale;* Cape May, *Martindale, H. Jackson, Miss H. C. Bond;* Ocean Grove, *Gardner, Miss Boice;* on all shores about New York Harbor, *Pike.*

POLYIDES, Ag.

P. ROTUNDUS (Gmel.), Grev. Growing on rocks near Stapleton, south shore of Staten Island, *Pike.*

GRINNELLIA, Harv.

G. AMERICANA (Ag.), Harv. New Brighton and New Dorp, Staten Island, *Britton, Pike;* Fort Hamilton, *Chamberlin;* a single specimen in Great Egg Harbor Bay, *Ashmead;* Ocean Grove, *C. A. Boice;* Asbury Park, *Gardner, L. E.*

Knight; Atlantic City, *Morse, Martindale, Miss Ray S. Comly, Murphy;* Longport, *Lawton, McCullough, J. Hood, Martindale, Miss Murphy,* who collected in the summer of 1888 some of the finest specimens ever seen on our coast.

DELESSERIA, Lamourx.

D. SINUOSA (Good. and Woodw.), Lamourx. Long Branch and at Prince's Bay, S. I., *Pike;* Sea Bright, *Horace Averill;* Ocean Grove, *C. A. Boice;* Atlantic City, *Morse.*

D. ALATA (Huds.), Lamourx. "Stapleton, S. I.," *Pike.*

D. LEPRIEURII, Mont. Fort Lee, N. Y., *Horace Averill,* etc., in Farlow Mar. Alg. New Eng; Atlantic City, on piling, *Morse, Martindale;* Longport, *Martindale.*

GRACILARIA, Grev.

G. MULTIPARTITA, J. Ag. Common from Cape Cod southward, *Farlow;* shores of Staten Island, *Chamberlin, Pike;* Long Branch, *Miss Morris;* Atlantic City, *Morse, Martindale, Murphy, Porter;* Longport, *Lawton, McCullough, Murphy, Martindale;* Somers Point, *Porter;* plentiful in Egg Harbor Bay, particularly on planted oysters, *Ashmead;* frequent in New York Bay, *Hooper.*

Var. ANGUSTISSIMA, Harv. Same localities, but less abundant. Cape May, *Martindale.*

CHONDRIOPSIS, J. Ag.

C. DASYPHYLLA (Woodw.), J. Ag. Plentiful in Little Bay and on Bond's Bar, growing in large tufts on sandy mud, *Ashmead;* Staten Island, *Pike;* Atlantic City, *Martindale;* Longport, *McCullough, Murphy, Martindale.*

C. TENUISSIMA (Good. and Woodw.), J. Ag. Common with the last, Egg Harbor, *Ashmead;* Asbury Park, *Gardner;* Atlantic City, *Morse, Martindale, Murphy;* Longport, *Lawton, McCullough, Martindale, Murphy;* Somer's Point, *Porter, Martindale;* Staten Island, *Pike.*

Var. BAILEYANA, Farlow. Atlantic City, Longport and Somer's Point, same collectors; New York Harbor, *Prof. Bailey, Pike;* Fort Hamilon, *H. Jackson.*

C. ATROPURPUREA (Harv.), J. Ag., var. FASCICULATA, Farlow. Fort Hamilton, N. Y., *Harvey,* Farlow Mar. Alg. New Eng.; Prince's Bay, S. I. and Pleasure Bay, *Pike.*

RHODOMELA, Ag.

R. SUBFUSCA (Woodw.), Ag. Staten Island, *Harvey;* New York Bay, *Hooper;* Prince's Bay, Staten Island, *Britton, Pike.*

Var. GRACILIOR, J. Ag. "South shore of Staten Island, April and May," *Pike.*

POLYSIPHONIA, Grev.

P. URCEOLATA (Dillw.), Grev. From New Jersey northward, *Farlow;* Long Branch, *Miss Morris,* in Harvey Ner. Bor. Am.; Atlantic City, *Morse, Martindale, Murphy;* Staten Island, *Pike.*

Var. FORMOSA, Ag. Fort Hamilton, etc., in New York Bay, *Harvey;* Cape May, *H. Jackson;* Atlantic City, *Morse.*

P. SUBTILISSIMA, Mont. Hoboken, 1861, *J. Hooper;* Communipaw and Staten Island, *Pike.*

P. OLNEYI, Harv. On *Zostera* in Egg Harbor Bay, *Ashmead;* very abundant in Pleasure Bay in August and September, *Pike;* Ocean Beach, *C. H. Kain;* Atlantic City, *Martindale, Morse;* Cape May, *H. Jackson.*

P. HARVEYI, Bailey. Abundant in bays and on Bond's Bar, Egg Harbor, *Ashmead;* Staten Island, *Pike;* Atlantic City, *Morse, Martindale, Murphy;* Asbury Park, *Gardner;* Ocean Grove, *C. H. Kain;* Longport, *Lawton, McCullough, Murphy, Martindale, Porter;* Somer's Point, *McCormick.*

P. FIBRILLOSA (Dillw.), Grev. Longport, *Lawton, Martindale.*

P. VIOLACEA (Roth), Grev. Fine specimens collected at Prince's Bay, Staten Island, *Pike.*

P. VARIEGATA (Ag.), Zan. Common from Cape Cod to West Indies, *Farlow;* New York, *Hooper;* Egg Harbor, *Ashmead;* Staten Island, Asbury Park, Atlantic City, Longport, all collectors; unusually large and fine specimens, Somer's Point, *Porter.*

P. ATRORUBESCENS (Dillw.), Grev. Long Branch, *Miss Morris;* Asbury Park, *Gardner;* Atlantic City, *Martindale, Morse;* Communipaw and Staten Island, *J. Hooper, Pike.*

P. NIGRESCENS (Dillw.), Grev. Staten Island, Fort Hamilton

and New York, *Pike;* abundant, Egg Harbor, *Ashmead;* Ocean Grove, *Miss Boice, Gardner, Kain;* Atlantic City, *Morse, Martindale, Murphy, Porter;* Longport, *Lawton, McCullough;* the latter secured some of the finest specimens yet found on the coast.

Var. FUCOIDES, Ag. Atlantic City, *Martindale;* Longport, *McCullough.*

Var. AFFINIS, Ag. Atlantic City, *Martindale, Murphy;* Longport, *McCullough.*

Var. DURKEEI, Harv. Atlantic City,, *Murphy, Martindale.*

Var. PLUMOSA, Harv. Longport, *McCullough,* very fine.

P. FASTIGIATA (Roth), Grev. Pleasure Bay, Communipaw and Staten Island, *Pike.*

BOSTRYCHIA, Mont.

B. RIVULARIS, Harv. Fort Lee, *H. Averill,* in Farlow Mar. Alg. New Eng; on piling at the drawbridge, Atlantic City, *Morse, Martindale, Murphy;* floating in the thoroughfare, *Porter;* Longport, *Lawton, McCullough, Martindale.*

DASYA, Ag.

D. ELEGANS (Mart.), Ag. Common in New York Bay at Communipaw and Staten Island, *Britton, Pike;* Atlantic City, *Morse, Martindale;* floating in the thoroughfare, *Porter;* Longport, *Lawton, McCullough, J. Hood, Murphy, Martindale.* The specimens collected by Miss Murphy in the summer of 1888 were very large and in very fine condition.

CORALLINEÆ.

CORALLINA (L.) Lamourx.

C. OFFICINALIS, L. Said to have been collected at Long Branch.

JANIA, Lamourx..

A specimen of this genus was collected at Longport in the summer of 1888 attached to *Sargassum,* washed up on the beach; possibly *J. rubens,* Lamourx, or *J. Cubensis,* Mont., but not sufficiently developed to determine with certainty.

MELOBESIA, Lamourx.

M. LE JOLISII, Rosanoff. Atlantic City, *Murphy, Martindale, Morse.*

M. FARINOSA, Lamourx. On the New Jersey coast and along Staten Island, *Pike;* Atlantic City, *Morse, Martindale, Miss H. C. Bond.*

M. PUSTULATA, Lamourx. Same stations and same collectors; Somer's Point, *Porter;* Longport, *Martindale.*

M. LENORMANDI, Aresch. Staten Island, *Pike;* Long Branch, Longport and Atlantic City, *Martindale.*

M. MACROCARPA, Rosanoff. Staten Island, *Pike.*

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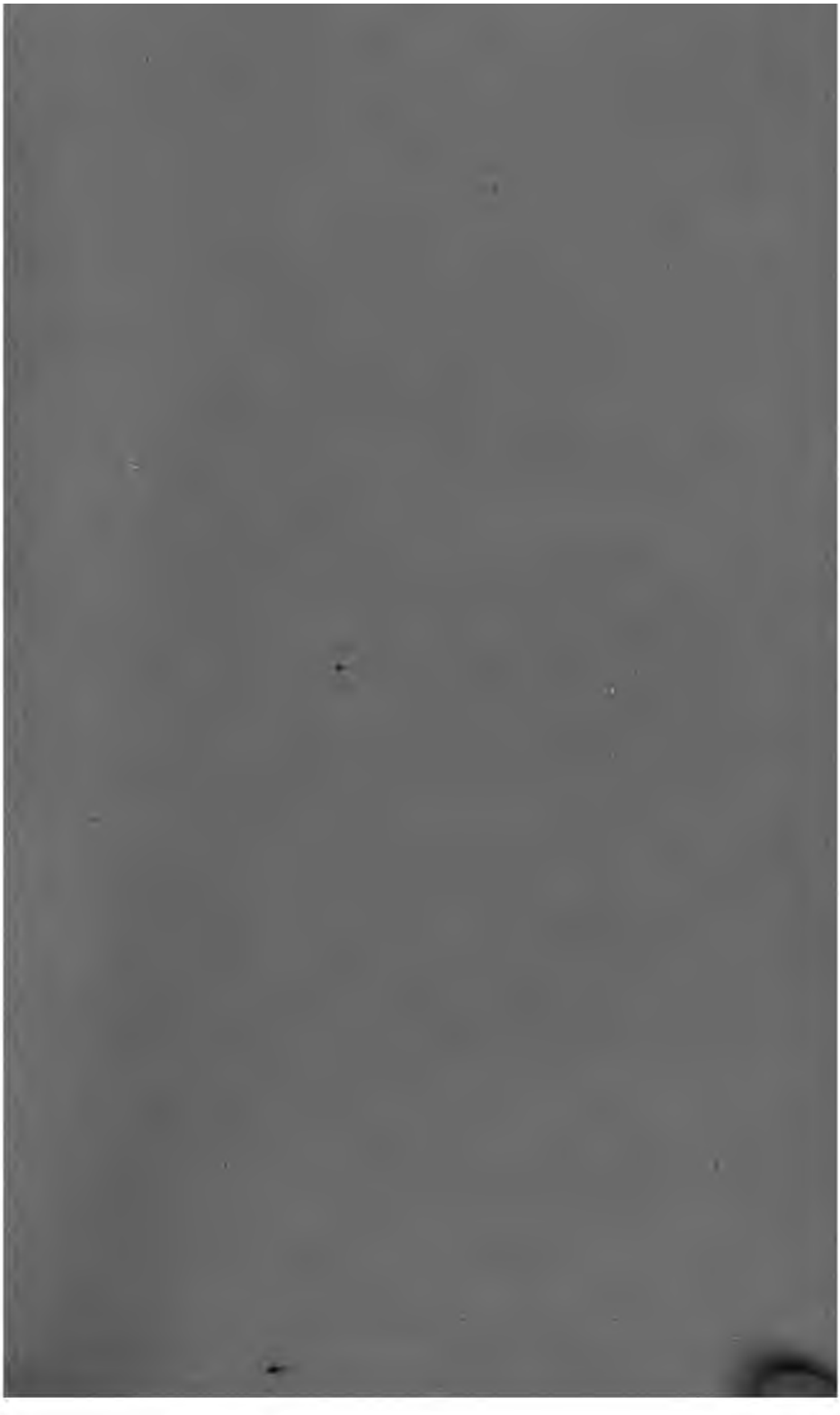

MEMOIRS

OF THE

TORREY BOTANICAL CLUB.

VOL. I. NO. 3.

HEPATICÆ BOLIVIANÆ,

IN ANDIBUS BOLIVIÆ ORIENTALIS, ANNIS 1885-6,
A CL. H. H. RUSBY LECTÆ.

BY RICHARD SPRUCE.

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BY RICHARD SPRUCE, Coneysthorpe, England.

The small collection of Hepaticæ made by Dr. Rusby on the eastern slope of the Bolivian Andes is an interesting addition to our scanty knowledge of the Cryptogamia of that region. It serves also for comparison with what we know of the hepatic flora of the Peruvian and Quitenian (equatorial) Andes, investigated by myself; of the Andes of New Granada, by Lindig and others; and of Mexico mainly by Liebmann. One curious fact brought out by that comparison is the greater correspondence of the hepatic flora of Bolivia with that of Mexico than with that of the equatorial regions (lat. 0°—7° S.) personally known to me. The climate and other conditions of growth in Mexico, a little within the northern tropic, may be more nearly conformable to those of Bolivia, in proximity to the southern tropic, than in the intervening portions of the Cordilleras. Anyhow, many of the hepatics of the highlands of Mexico are identical with those collected by Dr. Rusby at nearly the same altitude in Bolivia, and some of them were nowhere seen by myself near the equator. Of *Plagiochila*, for instance, at least three Mexican species which I did not gather in the Andes are proved to belong also in Bolivia; and two other Bolivian species which I suppose to be new have in Mexico their two nearest allies, neither of which is known to exist near the equator. *Lepicolea ochroleuca*, N. (*Sendtnera*, Syn. Hep.), a large and showy hepatic, grows rarely from Mexi-

co to the Falkland Isles, and now Bolivia is intercalated in its range; yet I never fell in with it. Fewer Bolivian species than might be predicated are identical with those of Chili or of South Brazil, but further researches may add to their number.

In the following catalogue the genera stand in nearly the same order as in my 'Hepaticæ Amazonicæ et Andinæ,' and I add a few prefatory remarks on some of the more notable genera and species.

A peculiar feature in the hepatic vegetation of Bolivia seems to be the paucity of species of *Frullania*, as contrasted with their great abundance and variety in the Equatorial Andes. They are such conspicuous plants, from their habit of forming large, shining, reddish-brown or lurid-purple patches on trees and rocks, that, if existent, they could not have been overlooked. Yet one species must have occurred in some quantity, as it forms the bulk of three of Dr. Rusby's packets; it is also new (*F. Boliviana*, n. sp.) and differs from its nearest ally, *F. tetraptera*, Mont., in the dioicous inflorescence and other important characters specified below. *F. tetraptera* was discovered by d'Orbigny in Chili, and a small fertile specimen has been picked out of Dr. Rusby's Sorata collections by Mrs. Britton. The remaining species are all in small quantity, but comprise some novelties, which will be described in their place.

The headquarters of the vast genus *Lejeunea* is in the hot, damp forests of equatorial plains. In the Quitenian Andes there is a considerable falling off in the number of species when we ascend above 4,000 feet, which is Dr. Rusby's lowest limit for hepatics in the Bolivian Andes. Three of his *Lejeunea* are in considerable quantity: *L.* (*Omphalanthus*) *filiformis* (Sw.); *L.* (*Taxilejeunea*) *isocalycina*, in broad, milk-white patches, rarely fertile; and a *Ceratolejeunea* which I have called *L. fastigiata*, n. sp., from the long, sub-simple stems growing in closely-packed bundles. Tropical ferns afford a prolific nidus for the minuter *Lejeuneæ*. On an *Acrostichum* gathered by Dr. Rusby grow, besides an undescribed *Radula*, some half dozen *Lejeuneæ*. One of these, *Ceratolejeunea malleigera*, n. sp., is the gem of the collection. It is abundantly fertile, and its most striking peculiarity is in the perianth being produced upward into two mallet-like

horns, that remind one of the antennæ of some tropical moths. *Lopholejeunea Rusbyi*, n. sp., is one of the larger species, and is fortunately in perfect state. Like its congeners it has the keels of the perianth bordered by a broad toothed wing, but in the acuminate serrated leaves it differs from all others. Most of the remaining *Lejeunea* are parasitic on other hepatics, and (with the exception of *L. denticulata*) are in small quantity—some indeed so scanty and imperfect that I do not venture to name them. Of those I recognize, the majority extend through tropical America to the Antilles and Mexico.

Radulæ are few and in small quantity, but include two new and very interesting species, and (what I was particularly pleased to see) good specimens, though sterile, of the true *R. Xalapensis*, Mont., which was so-named by Montagne from a site called Xalapa on the eastern side of Bolivia, and not from the famed Mexican city. *Radulæ*, like *Lejeuneæ*, are apt to grow much mixed up, and it was doubtless a specimen of *R. ramulina*, Tayl. which Gottsche received from Montagne under the name "*R. Xalapensis*" (having lurked undistinguished in the same tuft with the true plant) and described as such in "Mexikanske Levermosser." A stem or two of *R. ramulina* occurs attached to several of Dr. Rusby's *Plagiochilæ*: it is well distinguished from *R. Xalapensis* by its larger size, and especially by the abnormally large and overlapping lobule, in which it closely approaches the Irish *R. voluta*, Tayl.

Scapania Portoricensis, Gottsch. This, the only tropical American species of its genus known to me, and certainly one of the noblest, was gathered by myself in perfect fruit, growing on wax-palms in the forest of Canelos (June, 1857) and named in my MS. *Scapania splendida*, but not published until 1885. I did not even at the latter date know of the existence of a memoir on the Hepaticæ of Porto Rico, by M. M. Hampe and Gottsche, published so long ago as 1853, in which the same *Scapania* is described, but from barren specimens, and with the erroneous character of a quite entire lobule. Dr. Rusby gathered in Bolivia a single very fine plant of it, and I have picked fragments of the same off some of his other hepaticæ; but in these, as in others in Porto Rico and Jamaica (*Scap. grandis*, Bosw. in Journ.

Bot.) and in my own from Ecuador, the lobule is invariably finely toothed all round.

Isotachis serrulata, Sw., is one of the most conspicuous of hepaticæ from its size, its purple or blood-red color, and its habit of forming wide, dense patches, rarely with any admixture of other species. It is well represented in Dr. Rusby's collection, and we have it also from south Brazil and the Antilles, yet I was never fortunate enough to fall in with it.

The solitary species of *Herberta* (= *Sendtnera*, Syn.) differs from all others known to me by the serrated laciniæ of its deeply bifid leaves.

Bazzania is represented by four species, three of which have been previously found in Chili, New Granada, etc. *B. Rusbyi*, n. sp. is a very pretty species, notable for its pellucid foliage, its underleaves sharply spinuloso-dentate, etc. The Mexican *B. denticulata*, L. et G. is possibly its nearest congener, but is smaller, more opaque, and the underleaves are much less toothed, especially at the sides. In a genus where the numerous species are separated by such minute characters, two equally conscientious observers will often differ as to which are species and which varieties.

Of the five *Lepidoziæ* in the collection, two exist in some quantity, and were probably abundant. The one is *L. plumæformis*, nob. in Rév. Bryol. (1887) previously known to us only from scanty specimens gathered in south Brazil by Glaziou; the other is the widely-distributed *L. cupressina* (Sw.), which (as *L. tumidula*. Tayl.) extends as far north as the British Isles. A third *Lepidozia*, of which there are but few specimens, is a variety of *L. truncatella*, Nees, whereof the type is south African. Although the identity of an African with an American hepatic is to be admitted with caution, we have a few undoubted examples of such, e. g. *Lejeunea trifaria*, N. and *L. Sagraeana*, Mont.

Plagiochilæ constitute the bulk of Dr. Rusby's collection. They are in greatest variety in the sections Spinulosæ and Frondescentes, and they include a fair share of novelty. A *Plagiochila* near the common *P. asplenioides* of the north temperate zone, yet well distinguished, is the *P. alternans* of Gottsche, still known only in barren state. Although Dr. Rusby's specimens

extend its range from Mexico to Bolivia, and Mrs. Britton sends me the same, gathered by Mr. Hyde in Costa Rica, I never met with it in so much of the intervening space as I traversed.

In contrast with the abundance and variety of the Plagiochilæ Grandifoliæ in the Quitenian Andes is their paucity in Bolivia, only two species being clearly distinguishable. Yet one of these, *P. Notarisii*, notable for its large, flattish, semi-cordate, paucidentate leaves, seen by me in small quantity only in the valley of the Pastasa, has been gathered abundantly by Dr. Rusby.

Of the numerous species of the section Cristatæ I gathered in Amazonian and Andine forests Dr. Rusby's collection includes not one; but it has two other species, quite distinct from any of mine, whereof one had been previously discovered in Bolivia by d'Orbigny. The other (*P. Boliviana*, n. sp.), which I suppose to be new, comes very near the *P. punctualis*, G., found by Liebman in Mexico.

Lophocoleæ, with a single exception, are exceedingly rare. Of the sections Bidentatæ and Bicornutæ, so abundant in equatorial forests, fragments only of one, or possibly two species have been seen. But one other species, notable for its oblong-hexagonal leaves, with a ciliiform tooth at each of the four free angles (whence my name, *L. 4-dentata*, n. sp.) must have abounded, for it exists intermixed with nearly every other hepatic.

Of *Jungermania* there is only a single species, but it is new and very interesting. In the long sub-simple stems and the laterally accumbent roseate foliage, it might seem a slender form of *J. colorata*, from which it differs essentially in the *opposite* (not alternate) leaves, scarcely at all decurrent at the base. Unfortunately I found no perianths, though I sought for them sedulously.

The remaining genera are for the most part sparingly represented. There is one example of the anomalous genus *Noteroclada* (*N. arhiza*, n. sp.)—anomalous also as a species, from being almost utterly rootless, whereas its congeners have of all leafy hepaticæ the longest and strongest radicles.

There are luxuriant specimens, both ♂ and ♀, of *Marchantia chenopoda*, L.; and *Dumortiera hirsuta*, N., vindicates its claim to be a cosmopolite by appearing in very nearly the same form as the Irish variety (*D. irrigua*, Tayl.).

FRULLANIA, Raddi.

FRULLANIA (CHONANTHELIA) BOLIVIANA, n. sp.

Dioica, atropurpurea, flaccida, caulibus bipollicaribus, dense depresso-stratificatis, laxepinnatis bipinnatisque. Folia dissita, ramorum interdum subimbricata, late patentia, sub-concava, cordato-rotunda, auriculis baseos majusculis rotundis conniventibus; lobulus vix triplo brevior, cauli contiguus, late cuculliformis, margine orificii truncati interno paulo magis producto, sæpe compresso inflexus, nunquam evolutus; cellulæ parvulæ, subconformes, ad angulos incrassatæ. Foliola duplo breviora, dissita, subrotunda, ex alis basi præcipue recurvis ad speciem spathulata, undulata, interdum medio margine in angulum obtusum producta, apice ad vel ultra ⅓ acute obtuseve bifida, segmentis erectis acutis Flores ♀ in ramis terminales. Bracteæ bijugæ, foliis subæquilongæ, profunde bifidæ, cum bracteola in cyathum alte connatæ; lobo antico ovato, rotundato; lobulo angustiore, acuminato, canaliculato, extus lacinula aucto; bracteola angusta, breviter bifida, segmentis subulatis, margine utrinque 1-dentata. Perianthia alte emersa, involucro duplo fere longiora, elongate ovato-oblonga, dimidio supero fere rectangulari-prismatica, altiuscule 4-carinata, ex apice rotundato longirostria. Androecia in planta propriâ tenuiore axillaria, globosa, folia æquantia; bracteis parvulis paucijugis.—Folia 1.3×1.05, lobulus .5, cellulæ $\frac{1}{40}$; foliola .65×.55; bracteæ 1.2×0.9; perianthia 2.2×.95^{mm}.

Hab. Mapiri Boliviæ, alt. 5,000 ped; Unduavi, alt. 8,000 ped; Ingenio del Oro, alt. 10,000 ped. (Nos. 3,039, 3,040, 3,042). Ab hac distat *F. tetraptera*, Mont. (in Chili a d'Orbigny, in monte Sorata Boliviæ, alt. 10,000 ped. a Rusby lecta) florescentia monoica, statura minore, colore pallido viridive, foliis valde oblique cordatis, auricula antica magna truncata, postica vix ulla, apice cucullato-incurvis, lobulo interdum ex parte evoluto apiceque solum cucullato; foliolis brevissime (vix ad ½) fissis; bracteis acutis vel acuminulatis, lobulo acuminato subserrato; perianthiis ubique æquilatis, præalte carinatis.

F. (CHONANTHELIA) TETRAPTERA, Mont. Ann. des Sc. Nat. 1838. In monte Sorata, alt. 10,000 ped. (3,087 p. p.)

F. (METEORIOPSIS) ATRATA (Sw.). Frustula pauca inter alias hepaticas.

F. (THYOPSIELLA) BRASILIENSIS, Raddi. Inter *Plagiochilas* cæspitans.

FRULLANIA (THYOPSIELLA) HUMILIS, n. sp.

Dioica, pusilla, rufo-badia, caule vix semipollicari laxe pinnatim ramoso. Folia imbricata, patentia, subplana, oblique ovalia obtusa vel rotundata, basi antica semi-cordata (auricula oblonga subtruncata); lobulus triplo brevior, a caule parum distans et divergens, vel eidem fere parallelus, obconico-campanulatus, lævis, interlobulo tenui, subulato; cellulæ parvæ, pachydermes, subpellucidæ, subrhombeo-4—6-gonæ, inferiores sensim submajores. Foliola foliis haud duplo breviora, subcontigua, oblonga, breviter (ad $\frac{1}{5}$) bifida, segmentis subacutis, margine laterali recurvo, basi breviter auriculata. Flores ♀ in ramo terminales. Bracteæ intimæ foliis duplo longiores, lobo ovato apiculato integerrimo subplano, lobulo aquilongo angustiore deltoideo-lanceolato subacuto, infra medium utrinque rude unidentato; bracteola paulo brevior, libera, oblonga ad $\frac{1}{2}$ fere bifida, segmentis late subulatis acutis recurvo-canaliculatis, basi processulo tenui aucta. Perianthium (valde juvenile) lageniforme, apice in tubum sat longum et latum abiens, omnino ecarinatum. Pistillidia quatuor, prælonga. Folia .55×.35, lobulus .18, cellulæ $\frac{1}{10}$; foliola .32×.20; bracteæ 1.0×.65, bracteola .85×.5^{mm}.

Hab. Prope Yungas, Boliviæ, in Orchidearum radicibus (No. 3,061). A *F. Brasiliana* certe diversa, statura humiliore, foliis obtusissimis, etc.

FRULLANIA (THYOPSIELLA) MOLLICULA, Spruce. (*F. rigescens* var. *mollicula*, Hep. Am. et And.)

Dioica, rufescens, dense stratificata; caules bipollicares symmetrice sed laxiuscule bipinnati, frondem anguste oblongam sistentes, ramis sæpe arcuantibus. Folia concinne non autem arcte imbricata, late patentia, concava, oblique semicordato-ovata, ex rotundato apice præminute apiculata, rarius mutica, toto margine incurvulo, auricula antica oblongo-rotunda; lobulus 6-plo fere brevior, erectus, anguste conicus, obtusus; cellulæ parvæ, opacæ, omnes fere—ad mediam basin præcipue—oblongatæ, trigonis magnis pellucidis. Foliola imbricata, foliis æquilata, dimidio breviora, orbiculata, ad $\frac{1}{3}$ bifida, segmentis sub-acutis, margine anguste recurva, basi utrinque auricula magna rotunda aucta. Flores ♀ in ramis terminales. Bracteæ foliis sat majores, cochleato-concavæ, appressæ, ovato-orbiculatæ, ad $\frac{1}{2}$ bifidæ, lobis sub æqualibus breviter tenui-acuminatis, postico autem inæqualiter bilobo et paucilaciniato; bracteola late ovalis, segmentis longius acuminatis sublaciniatis. Perianthia subsemiemersa, subcylindrica, alia superne paulo latiora, valde obtusetrigona—in ætate fere teretia—ex apice corrugato-inflexo, demum lacero, tenuirostel-

lata.—Folia 1.4×.9, lobulus .25, cellulæ $\frac{1}{10}$; foliola 1.0×.9; bracteæ 2.0; perianthia 3.0×1.0^{mm}.

Hab. Ad Yungas, Boliviæ, alt. 6,000 ped. (no. 3,062 p.p.)—A *F. rigescente* et *F. laticauli* recedit habitu graciliore, ramificatione concinna; foliis subovatis; foliolis grandiauriculatis, paulo longioribus quam latis; bracteis latioribus, longius acuminatis, lobis pauciliniatis vel fere integerrimis; perianthiis apice pro m. inflexis. (Stirps Peruviana parum differt bracteis semper subintegerrimis et perianthiis apice conicis raro inflexis.)

FRULLANIA (THYOPSIELLA) LATICAULIS, n. sp.

Dioica, rufo-badia, caule 2-pollicari inæqualiter pinnato et subbipinnato, ramisque late foliatis. Folia arcte imbricata, patenti-divergentia, semicordato-oblonga abrupte subacuta, raro subapiculata, toto margine incurvulo, auricula antica subtruncato-rotundata; lobulus parvus (folio 5-plo brevior) tectus, breviclavatus vel obovatoc ylindricus, cauli approximatus et subparallelus, lævis, interlobulo minuto triangulari; cellulæ parvæ pachydermes subæquilateræ. Foliola imbricata, late orbiculata, foliis æquilata sed breviora, basi breviter biauriculata, apice ad $\frac{1}{3}$ acute bifida, segmentis ovatis minute apiculatis, apiculo (e margine toto anguste recurvo) abscondito. Flores ♀ terminales. Bracteæ intimæ foliis majores ultra $\frac{1}{2}$ bilobæ, lobis oblique ovato-oblongis cuspidatis, postice pauci-rude-dentatis, lobulis subæquilongis inæqualite rbifidis et segmentis bracteolæ oblongæ ad $\frac{1}{2}$ fissæ lanceolatis acuminatis breviuscule laciniatis.—Folia 1.4×1.0, lobulus .3, cellula $\frac{1}{15}$; foliola .9×1.0; bracteæ (lobus) 1.8×1.0, bracteola 1.6×9^{mm}.

Hab. Ad Yungas Boliviæ, alt. 6,000 ped. no. 3,062 p.p.—Ab hac differt *F. rigescens* Hep. Amaz., foliis brevioribus et rotundioribus, auriculâ anticâ majore crispatâ, margine postico toto fere latius incurvo (ad *Lej. xanthocarpæ* instar), lobulo præminuto; foliolis basi angustatis; bractearum lobulis bracteolisque longissime laciniatis; perianthiis apice subulatis.

OBS.—*F. laticaulis*, although included in the same packet as *F. mollicula*, had evidently grown apart from it, and, when moistened, the much broader stem (with the leaves), the irregular branching, and the other characters, seemed sufficient to separate it specifically.

FRULLANIA (DIASTALOBA) ODONTOSTIPA, n. sp.

Dioica, pusilla, rufo-badia, laxe reptans, caule sesquipollicari, pinnato, ramis breviusculis sæpe parvifoliis. Folia dissita vel

contigua—ramea subimbricata—subdivergentia, late oblique ovata, subplana, apice decurvulo abrupte acuta vel brevissime apiculata, basi antica subsemicordata caulem velantia; lobulus 4-plo brevior, obovatus clavatusve, celluloso-papulosus, a caule distans, parum divergens, interlobulo magno subrhombeo; cellulæ parvulæ rhomboideo-hexagonæ, trigonis magnis,paucæ basales submajores. Foliola foliis vix duplo breviora, subquadrata, ad ⅓ bifida, segmentis subacuminatis, utrinque rude 1-3 dentatis lacinulatisve.—Folia .65×.55, lobulus .15, cellulæ $\frac{1}{10}$; foliola .35×.30mm.

Hab. Supra *Lejeuneam filiformem*, Sw. reptans, pauca exemplaria sterilia carpsi. (No. 3,069, etc.)—A *Frullania Magellanica* ceterisque Diastalobis certe distincta.

LEJEUNEA, Lib.

L. (OMPHALANTHUS) FILIFORMIS (Sw.) Ubique Andium sylvestrium, in ditione Yungas præcipue, frequens, nunc cespites latos homogeneos sistens, nunc *Plagiochilis* ceterisque hepaticis immixta (Nos. 3,069, 3,043, 3,017, 3,083 p.p.)

L. (BRYOPTERIS) TENUICAULIS, Tayl. Ingenio del Oro, 10,000 ped., pl. ♂ sola. (No. 3,030).

L. (BRACHIOLEJEUNEA) LAXIFOLIA, Tayl. Sorata, 10,000 ped. No. 3,087; Unduavi, 12,000 ped. (No. 3,089 p.p).

L. (BRACHIOLEJEUNEA) BICOLOR, Mont. Frustula sola, cum *Plagiochilis* mixta.—First described by Montagne from Bolivian specimens, gathered by d'Orbigny.

LEJEUNEA (BRACHIOLEJEUNEA) CLAVULATA, n. sp.

Dioica, pallide rufo-viridis, caule e caudice repente libero subarhizo, pollicari, vage ramoso. Folia dense imbricata, superiora sensim majora, decurva, in sicco devoluta (unde rami clavato-julacei videntur), oblique semicordato-ovata, rotundata vel abrupte obtusa, recte vel subsinuato-complicata; lobulus triplo fere brevior, ad carinam convexam inflatus, margine appresso transverso tridenticulato; cellulæ mediocres, subpellucidæ, pariete ad angulos, interdum etiam ad latera incrassato. Foliola perpaulo minora imbricata, late orbiculata, longissime decurrentia, toto ambitu, (apice excepto) recurva, cochleata. Flores ♂ in rami apice mediove spicati; bracteæ plurijugæ, foliis minores, inflatæ, lobo ovato, lobulo breviore apice libero plerumque triangulari; antheridia bina, magna, stipitata.—Folia 1.3×0.9, lobulus alt. .5, cellulæ $\frac{1}{15}$; foliola .65 longa (ad axin) 1.0 (ab ipsa basi decurrente), 1.0mm lata.

Hab. Mapiri, Bolivia, (No. 3,072). *L. corticali*, L., et L. subaffinis, differt, ramis clavatis, foliis multo majoribus, foliolis pro ratione maximis, apice rotundatis (nec cuneatis ac retuso-truncatis).

L. (HOMALOLEJEUNEA) GUILLEMINIANA, Nees. Exemplaria perpauca (fertilia) inter *Plagiochilas* vigentia.

L. (DICRANOLEJEUNEA) AXILLARIS, Mont. Inter cæspites *Taxilej. isocalycinæ*, e. a. serpens.

LEJEUNEA (LOPHOLEJEUNEA) RUSBYI, n. sp.

Monoica et dioica, olivaceo-viridis, elatiuscula, caule repente, 1—1½ poll. longo, vage ramoso, ramis inæquilongis. Folia subdivergentia, subimbricata, oblique semicordato-ovata, breviuscule acuminata, acuta, apice decurvo serrulata, raro integerrima, subsinuato-complicata, lobulo plus duplo breviore, inflato, ovoideo-conico, apice truncato, apiculo incurvo aucto; cellulæ mediocres, conformes ambitu opacæ, trigonis parvis ad angulos et media latera incrassatæ. Foliola lobulis sub-breviora, distantia, orbiculata, apice leviter recurva. Flores ♀ in caule ramove terminales, absque innovatione. Bracteæ foliis longiores, falcato-dimidiatæ, acuminatæ, toto fere margine distanter serrulatæ, lobulo duplo breviore lineari subcomplicato auctæ; bracteola (= bracteæ ⅔) oblongo-rotunda, integerrima. Perianthia alte emersa, obovata, brevirostria, inferne sensim angustata, compressula, alte 4-carinata (facie antica subecarinata), carinis ab ipsa ferebasi alâ crebre laciniatâ armatis, laciniis subulatis curvulis. Androecia ramo inferiore constantia; bracteæ plurijugæ, lobis parum inflatis, subæqualibus, obtusatis.—Folia .85×.65, lobulus .38, cellulæ $\frac{1}{11}$; foliola .35×.4; bractea 1.05×.65, bracteola .65×.6; perianthia 1.3 ×.9^{mm}.

Hab. Inter *Plagiochilas* ad Mapiri Boliviæ orientalis; alt. 5,000 ped. (No. 3,081). A *L. Muelleriana*, G. proxima, differt foliis acuminatis subserratis, foliolis longe minoribus, etc.

L. (ANOPLOLEJEUNEA) HERPESTICA, Hep. Am. et And.—In *L. filiformi* aliisque hepaticis sparsim hospitans.

This very curious hepatic was found only once by myself, in very small quantity, but fertile, on the upper Rio Negro. In Bolivia, however, it was gathered by Dr. Rusby at all his stations, growing sparingly, intermixed with other hepatics, and always sterile.

L. (ODONTOLEJEUNEA) PERUVIANA, L. et L. In *Acrostichi* frondibus ad Yungas (No. 3,025 p.p.)

L. (PRIONOLEJEUNEA) LEPTOCARDIA, Spruce, Hep. A. et A. In *Acrosticho*, cum priore, pulchre fructifera.

L. (PRIONOLEJEUNEA) DENTICULATA, Web. In *Plagiochilis* frequenter reptans. Sterile plants of one or two apparently distinct species also occur, but very sparingly.

L. (PRIONOLEJEUNEA) MICRODONTA, G. In *Plagiochila*, parcissime.

LEJEUNEA (CERATOLEJEUNEA) MALLEIGERA, n. sp.

Monoica, pusilla, rufo-badia, subbipinnata, caule semipollicari prostrato. Folia sat magna, subimbricata, late patentia, vix decurvula, late dimidiato-ovata, subfalcata, integerrima, abrupte acuta, rarius subobtusa, recte vel subsinuato-complicata, lobulo 5-plo breviore, ovato-rhomboideo, subinflato, truncato; cellulæ parvulæ, leptodermes, subconformes, basin et marginem posticum versus sensim submajores. Foliola triplo breviora, distantia, ovalia, ad ½ bifida, segmentis acutis vel subobtusis. Flores ♀ in ramo pro m. brevi, innovatione suffulti. Bracteæ appressæ, foliis breviores, complicato-bilobæ, lobis semiobovato-lanceolatis obtusatis; bracteola cuneato-lanceolata, ad ½ bifida, segmentis acutis. Perianthia nisi pro cornibus immersa, obovato-obconica, sat compressa, tetragona, angulis duobus posticis in cornua clavata (formâ potius bicipitis mallei) erecta protracta, clavis apicalibus sat magnis subcylindricis, pallidis, reticulatis, ad speciem stipitatis. Androecia spicata; bracteæ subdissitæ, oblongo-cymbiformes, fere æquilobæ.—Folia .75×.5, lobulus .15, cellulæ $\frac{1}{10}$; foliola .25×.15; bracteæ .5, bracteola .4; perianthia .4×.2 (sine malleis .3; capite .2, stipite .1^{mm}.)

Hab. In fronde *Acrostichi*, in Andibus Boliviæ orientalibus (No. 3,025 p.p.).

LEJEUNEA (CERATOLEJEUNEA) FASTIGIATA, n. sp.

Dioica, elata, olivaceo-badia, caulibus 2-3 pollicaribus, arcte cæspitosis, fastigiatis, subsimplicibus, rarius ramulis parvifoliis pinnulatis. Folia magna, subimbricata, valde decurvo-concava, semicordato-oblonga vel ovato-oblonga, basi anticâ caulem late transeuntia, posticâ subrecte lobulata, lobulo minuto ovoideo apice inflexo, in ramis interdum majore et saccato, raro in utriculum magnum dilatato, apice plerumque subabrupte breviapiculata rarius 2-4 denticulata; cellulæ mediocres, subpellucidæ, conformes, basin versus paulo majores ocellum vix sistentes. Foliola foliis subæquimagna, late orbiculata, basi profundissime cordata, apice rima triangulari ad ¼ fissa, segmentis subacumi-

natis acutis, margine utrinque late incurva. Flores nullos invenire potui.—Folia 1.3×1.0, 1.05×.75; lobulus .15, cellulæ $\frac{1}{18}$; foliola .95×1.05, .8×1.05^{mm}.

Hab. In Andibus Boliviæ orientalibus sylvaticis, ut videtur ad rupes humidas, sociis *L. filiformi*, *Leioscypho schizostomate*, *Jungermania oppositifolia* n. sp., late cæspitosa, vel in *Plagiochilis* repens, (No. 3,035A, &c). Ab affinibus distat foliis pro m. breviapiculatis; foliolis maximis, basi altissime emarginato-cordatis, segmentis apicis subacuminatis. Frequens videretur, semper autem sterilis et eflorifera.

L. (CERATOLEJEUNEA) ARHEXIA, Spruce Ms.—A single stem growing with *L. pallescens*. Among my Andine plants I have found fertile specimens of this new species, which is one of the very few Ceratolejeuneæ having underleaves entire at the apex.

LEJEUNEA (HARPALEJEUNEA) INCRESCENS, n. sp.

Monoica, minuta, caule 3^{mm} longo, repente, parce et vage ramoso. Folia subcontigua, subplana, divergentia, oblique ovalia breviuscule acuminata, acuta, sinuato-complicata; lobulus triplo brevior, semiovoideus, turgidus, apice inflexo; cellulæ parvæ subæquilateræ, planæ, pellucidæ, ambitu anguste opacæ. Foliola minuta, lobulis subduplo breviora, squarrosa, obovata, ad ½ bifida, segmentis acutis. Flores ♀ in ramo brevi (innovato) terminales. Bracteæ foliis sublongiores, lanceolatæ, parvi-lobulatæ; bracteola angusta, ad ¼ bifida. Perianthia parum emersa, late pyriformia, subturbinata, 5 carinata, carinis papillis articulatis armatis. Androecia rara, parva, bracteis 1-2 jugis.—Folia .3×.2; perianthia .45×.35^{mm}.

Hab. In *Lej.* (*Bryopteride*) *tenuicauli*, T., parasitans, juxta Ingenio del Oro, Boliviæ.—A nostra *L. trachygona*, Hep. A. A. diversa, cui adsunt caulis pinnatus, folia ovato-acuminata, fornicata, celluloso-crenulata, perianthia multo longiora, etc.

Flowerless stems of two other *Harpalejeuneæ* were picked off other hepaticæ, but too imperfect to be named with certainty.

L. (DREPANOLEJEUNEA) STENOPHYLLA, Ldng.?—Mapiri, 5,000 ped (No. 3,075 p. p.)—I have not seen original specimens of Lindenberg's plant, but fertile specimens picked out of Liebmann's hepatics agree with the description in "Hep. Mexicanæ," and they are quite the same as the Bolivian plant, which, however, is sterile.

L. (DREPANOLEJEUNEA) INCHOATA, Meissn. Frustula sola visa in *Plagiochila* parasitantia.

L (TAXILEJEUNEA) ISOCALYCINA, G. Yungas, etc., ut videtur haud infrequens, colore albicante insignis, raro tamen fertilis. (Nos. 3,035, 3,028 p. p.).

LEJEUNEA (TAXILEJEUNEA) MARASMODES, n. sp.

Dioica (?) virens, flaccidissima, caule pollicari parum ramoso. Folia distantia, subplana, semiovato-triangularia, apiculata acuminulatave, elobulata, basi antica rotundata vix semicordata; cellulæ mediocres, subconformes, pellucidæ. Foliola plus duplo breviora, distantia, late subcordato-ovata, ad ⅓ obtuse fissa, segmentis acutis. Flores ♀ in ramo brevi seriati (manci solum visi). Folia 1.0×1.0, cellulæ $\frac{1}{55}$; foliola .4×.4^{mm}.

Hab. Supra *Noterocladam arhizam* et *Marchantiam* sp. repens, ad Sorata, alt. 10,000 ped., in Andibus Bolivianis sub. No. 3,005 p.p.

L. (MACROLEJEUNEA) SUBSIMPLEX, Mont. Pauca exempl. in *Plagiochila* decerpta.

L. (MACROLEJEUNEA) PALLESCENS, Mitt. var. Yungas, 6,000 ped. (No. 3,050 p.p.). A typo æquatoriali differt foliis planioribus brevius acuminatis; foliolis basi vix cordatis, segmentis solum acutis. Perianthia autem eadem sunt: minuta, primum superne obtuse 5-gona, matura teretia, solum apice obscure 5-corrugato inflexo. Florescentia etiam monoica exacte conformis est.

L. (HYGROLEJEUNEA) CERINA. Yungas, 6,000 ped. (No. 3,028 p.p.)

L. (HYGROLEJEUNEA) REFLEXISTIPULA. Frustula supra *Plagiochilam* inventa.

LEJEUNEA (HYGROLEJEUNEA) PASTASENSIS, Spruce, in Hep. Am. et And. var. PUNCTULATA n. var.

Dioica, caule pollicari, repente, subpinnato. Folia magna flavescentia, subimbricata, late patentia, oblique semicordato–ovata, apice decurvo acuta, subsinuato-complicata, lobulo vix triplo breviore semiovato, solum ad plicaturam subrectam subinflato, margine rotundato appresso, in lobum sensim transeunte vel breviter truncato; cellulæ mediocres, leptodermes, pellucidæ, aliæ autem ubique in folio sparsæ, cæteris cellulis æquimagnæ vel minores, annulo opaco circumdatæ, solum in centro pellu-

cidæ. Foliola paulo minora, subimbricata, cordato-reniformia, apice lato recurvulo brevissime bidentula, dentibus acutis, sinu obtuso.—Folia 1.5×1.25, lobulus .6×.4; cellulæ $\frac{1}{10}$; foliola .85 ×1.1^{mm}.

Hab. Bolivia, juxta Mapirí, in arboris ramulo, (No. 3,075).—*L. devoluta*, Hep. Am. et And. folia foliolaque habet minora, crenulata, hæc magis transversa toto margine recurva, cellulas minores, omnes conformes; *L. Pastasensis* ejusd. op. tamen a stirpe Boliviana vix differt nisi foliis subapiculatis epunctatis.

LEJEUNEA (EULEJEUNEA) GRACILICAULIS, n. sp.

Dioica, pusilla, virescens, caule semipollicari, repente, tenui, flaccido, elongato, sæpe ramulis parvifoliis pinnulato. Folia subdissita vel parum imbricata, late patentia, plana, suboblique oblongo-orbiculata, subsinuato-complicata, lobulo 4-plo fere breviore, ovoideo, inflato, apice brevi inflexo; cellulæ parvulæ, pellucidæ, leptodermes. Foliola foliis triplo breviora, obovato-cuneata, ultra ½ bifida, segmentis lineari lanceolatis, 4 cellulas latis, obtusis vel subacutis.—Folia .45×.35, lobulus .125, cellulæ $\frac{1}{10}$; foliola .15^{mm}.

Hab. Bolivia, loco Mapirí, *Plagiochilæ* sp. irrepens (No. 3,078 p.p.).—Ab omnibus Eulejeuneis parvistipulis diversa.

L. (EULEJUNEA) GAUDICHAUDII Ldng. var. In *Plagiochilis* parasitans (No. 3,049, 3,075, &c., p.p.). Cum exempl. cl. Gaudichaudi archetypis comparata foliis laxioribus planioribusque et vix aliter differt.

L. (EUOSMOLEJEUNEA) CONDENSATA Spruce, Hep. Am. et And. Yungas, &c., cum *Lepidoziis* præcipue consociata (No. 3,070, 3,071, 3,075, p.p.).

RADULA, Dumort.

R. RAMULINA, Tayl. (*R. Xalapensis* G. Mex. Leverm. nec Montagnei).—Yungas, cum *Plagiochila frausa* (No. 3085 p. p.); etiam *Plagiochilas* varias varo infestans.

R. XALAPENSIS Mont.! Ann. des Sc. Nat. (1836); ejusdem in d'Orbigny Voy. dans l'Amérique, 62, t. 2, fig. 4.

Through the favor of M. Bescherelle I have been able to examine Montagne's original specimens of this species, and can testify to the accuracy of his description and figure above cited. The "*R. Xalapensis*" described by Gottsche in 'Mex. Levêrm.'

is an entirely different plant, viz. the *R. ramulina*, Tayl., which stands next to the Irish *R. voluta*, Tayl. Dr. Rusby gathered the true *R. Xalapensis* at Yungas (alt. 6,000 ft.), No. 3,034, and *R. ramulina* occurs sparingly in several packets of his collection, mixed mainly with *Plagiochilæ;* but his *R. Xalapensis* is accompanied by a new and very distinct species of the same genus (*R. clavulata*, Ms.) which has the rare peculiarity of a monoicous (autoicous) inflorescence, the great mass of the genus consisting of purely dioicous species.

R. PALLENS, Sw. *var.* Yungas, etc., (cum Nos. 3,063, 3,009, 3086, mixta).

R. AMAZONICA, Spruce Hep. A. et A. Inter Plagiochilas rarius reptans. (No. 3,055, etc.)—Specimina speciei affinis, nimis juvenilia et incompleta, adsunt sub No. 3,052.

RADULA MAMMOSA, n. sp.

Dioica, pusilla, flavens, arcte repens, caule 1-1½-pollicari, laxe bipinnato, ramis subinde dichotomis. Folia subimbricata, supra lobulum divergentia, falcato-oblonga, rotundata, valide sinuato-complicata; lobulus plus duplo brevior, subrhombeus, valde saccatus et ex eo deorsum arcuatus vel fere in angulum abiens, mammillam præaltam obtuse conicam proferens, ad originem superiorem haud auriculatus; cellulæ parvulæ, opacæ, trigonis nullis. (Folia caulina inferiora interdum vix mammillifera). Flores ♀ terminales cum innovatione, sæpe dichotomiales. Bracteæ foliis minores, magis falcatæ, lobulo angusto plano. Perianthia alte exserta, foliis 4-5 plo longiora, stricta vel arcuantia, clavato-tubæformia, inferne teretia, ore compresso, truncato, obscure laticrenato.—Folia .8×.55 (ad lobuli apicem)×.8 (ad basin ipsum) lobulus .3 (ad insertionem mensus), cellulæ $\frac{1}{10}$; perianthia 3.0-4.0 ×.55mm.

Hab. Bolivia orientali in *Acrostichi* frondibus cum *Lejeuneis* repens. (No. 3,025 p.p).

RADULA CLAVÆFLORA, n. sp.

Autoica, flavicans, 1-1½ pollices longa, caule nisi in ipsa basi a matrice libero subpinnatim ramosa. Folia subplana, subimbricata, late patentia, basi in caule utrinque alte incurrentia, semicordato-oblonga, rotundata auricula basali caulem transeunte, subrecte complicata; lobulus triplo fere brevior, subquadratus, ad carinam vix inflatam recte vel arcuatim decurrens, obtusus, margine supero carinæ subparallelo medio sinuato-inflexo, angulo

basali libero parvo caulem vix velante, mammilla vix ulla, raro radicellifera; cellulæ parvæ, subæquales, ambitu late opacæ, pariete pellucido ad angulos perpaulo incrassato. Flores ♀ terminales, innovati, sæpe dichotomiales. Bracteæ foliis subbreviores erectæ, complicatæ, lobo subfalcato-oblongo, lobulo fere æquilato duplo (vel solum dimidio) breviore. Perianthia foliis plus duplo longiora, clavata, inferne teretia, ore compresso truncato subcrenulata. Androecia in caule ramisque media, rarius terminalia; bracteæ paucijugæ, foliis breviores, turgidæ, lobulo lobi ⅔ æquante.—Folia 1.3×0.9, lobulus (ad carinam) .5, cellulæ $\frac{1}{18}$; bracteæ lobus 1.1×.55; perianthium 3.0×.3 (basi)×.7 (apice) mm.

Hab. Ad arborum ramos in prov. Yungas, Bolivæ, alt. 6,000 ped., socia *R. Xalapensi* Mont.—*R. Cordovana* Steph. in 'Hedwigia' (1884), huic quoad florescentiam proxima, differt foliis ovatis, haud decurrentibus, et perianthio a basi obconica oblongo.

SCAPANIA, Dumort.

S. PORTORICENSIS, Hampe et G., Hep. Portoricenses (1853); *S. splendida*, Spruce, Hep. A. et A. (1885). Yungas, alt. 6,000 ped. (No. 3,068 p.p.)

ISOTACHIS, Mitt.

I. SERRULATA (Sw). Yungas, alt. 6,000 ped. (No. 3,037). Unduavi, alt. 10,000 ped. (No. 3,038.). Specimina pulcherrima!

HERBERTA, Gray.

HERBERTA SERRATA, n. sp.

Dioica, rufo-fusca, caule bipollicari, a basi tenui subrhizomatosâ parce flagelliferâ assurgens, simplex vel subramosa. Folia magna, densa, inferne breviter erecta dein subsquarroso-secunda, foliolaque (vix minora, magis exacte transversa) dimidio inferiore ovalia concava, margine runcinato-dentata, basi subsagittatim producta, ad medium bifida; laciniis lineari-subulatis, acutis, canaliculatis, inæqualiter serratis; cellulæ subconcolores, axiales (pluriseriatæ) majusculæ, lineares, plerumque medium versus utrinque isthmo tenui cum collateralibus anastomosantes, marginales breviores subrhomboideæ, omnes valde pachydermes, pariete latissimo. Flores ♀ in caule terminales, innovati. Bracteæ plurijugæ foliis submajores, dense imbricatæ, profunde bisulcæ, infra medium arcte runcinato-dentatæ; laciniæ laciniato-serratæ.—Foliorum pars integra 2.0×1.35, laciniæ 2.0×0.5, cellulæ mediæ $\frac{1}{16}$, submarginales $\frac{1}{18}$ mm.

Hab. In Boliviæ Andibus, loco Unduavi, alt. 10,000 ped., muscis immixta, (No. 3,084).—Differt *H. runcinata*, Tayl. foliis basi cordatis, laciniis integerrimis, etc.

LEPICOLEA, Dumort.

L. OCHROLEUCA, Nees. Yungas, alt. 6,000 ped. (No. 3,068 p. p.)

BAZZANIA, Gray.

B. ARCUATA, L. et G. Mapiri, alt. 5,000 ped. (No. 3,027).

B. CHILENSIS, Steph. Yungas, alt. 6,000 ped. (No. 3,029 p. p).

B. LINDIGII, Gottsch. Yungas, alt. 6,000 ped. (No. 3,023).

BAZZANIA RUSBYI, n. sp.

Dioica, depresso-cæspitosa, 5^{cm} longa, pallide viridis, pellucida, iteratim dichotoma, angulo furcavum recto, flagellifera. Folia majuscula, alterna, subimbricata, patenti-decurvula, oblique semicordato-ovato-ligulata, oblique truncato-tridentata, dentibus subacuminatis acutis, medio plerumque submajore, sinubus acutis rarius obtusis, basi anticâ caulem transeuntia, posticâ inflexa; cellulæ pellucidæ, subconformes, axiales et subbasales submajores et oblongatæ, ad auriculam multo minores, omnes pachydermes trigonis (haud magnis) solum ad angulos, mediis nullis. Foliola triplo fere breviora, contigua vel subdissita, rotundo-quadrata, toto margine argute spinuloso-dentata, spinulis ad apicem latum truncatum 5-8, ad marginem utrinque sub 4, basi hinc minute auriculata, illinc cum folio collaterali subconnata; cellulæ omnes conformes, basin versus sensim paulo minores.—Folia 2.35×1.35, cellulæ mediæ $\frac{1}{18}$; foliola .85×.85^{mm}.

Hab. In Bolivia orientali, alt. 6,000 ped., loco Yungas, ad truncos velustos. (No. 3,029).—Species insignis, quoad foliola ubique argute dentata, solum cum *B. Peruviana* et *B. Novæ-Hollandiæ* comparanda, quibus autem adsunt folia semper opposita. *B. Lechleri*, Steph. subsimilis, minor est, fuscescens, sinubus foliorum apicalibus lunatis; foliolis margine solum angulatis, cellulis apicalibus elongatis. *B. denticulata*, L. et. G., forsan magis affinis, distat statura humiliore, opacitate (quando *B. Rusbyi* insigniter pellucida est), foliolis multo minus argute dentatis, margine præcipue, etc.

LEPIDOZIA, Dumort.

L. CUPRESSINA (Sw). Yungas; Mapiri, cum Orchideis, etc. (Nos. 3,026, 3,064, 3,070, 3,071). Agrees well with an original Jamaican specimen from Swartz. Grows in wide depressed tufts, very much as *L. reptans* does with us. Leaves have sometimes, but very rarely, 1-3 rudimentary teeth at antical base. Near insertion of a branch a six-cleft underleaf is occasionally seen. Laciniæ of both side leaves and under leaves are simply subulate, rarely with the slightest acumination. But in the Peruvian *L. tenuicuspis* (= *L. cupressina* var. *tenuicuspis*, Hep. A. et A.) all the leaf segments end in a slender cusp of a single row of cells—in the underleaves as much as 6-9 cells long. From this and some other differences I prefer to regard it as a distinct species, under the MS. name (*L. tenuicuspis*) proposed in 'Hep. Am. et And.'; especially as I have seen no intermediate form from any country.

LEPIDOZIA TRUNCATELLA, N. VAR. ALTIRIMATA, S.

Dioica, griseo-viridis, laxe depresso-cæspitosa; caules sesquipollicares laxe pinnati, pinnis longitudine variis, aliis prelongis, persæpe apice flagellari-attenuatis, rarius pinnulatis. Folia imbricata, subtransversa, concava, suboblique ovato-quadrata, profunde 4-fida (antice paulo ultra medium, postice ad ¾ usque), basi utrinque subampliata, antice rude 2–3–dentata, postice hastatim 1-dentata; laciniæ subulatæ repandæ, postica paulo minore, sinubus acutis, cellulæ parvæ, subquadratæ, pachydermes, trigonis vix ullis. Foliola perpaulo breviora, quadrata, basi utrinque 1–3 dentata, ab apice ultra ¾ quadrifida, laciniis lineari-subulatis, obtusis vel subacutis, repandis, quinta minore interdum adjecta.—Folia .5×.5; foliola .4×.35; cellulæ $\frac{1}{55}$mm.

Hab. ad viam quæ ducit à Sorata ad Mapirí, in arboribus vetustis saxisque (No. 3,082)—A. *L. truncatella*, L. et G., Capensi, distat foliis, foliolisque magis profunde fissis vix autem specifice separanda.

L. PLUMÆFORMIS, Spruce, n. sp. in Hep. Glaziovianis No. 7,135 Rév. Bryol. 1887.—Yungas, alt. 4,000 ped. (No. 3,046).

L. CAPILLARIS, Sw.—Cum *Plagiochilis* et *Bazzaniis* rarius immixta, semper sterilis.

L. (TELARANEA) sp.—Cum priore aliisque, rarissime. Forsan pro *L. chætophyllæ*, Hep A. et A. var. habenda.

CEPHALOZIA, Dumort.

1. CEPHALOZIA FRAGILLIMA, n .sp.

Dioica, pusilla, albicans, caule semipollicari, tenui, fragillimo, paucirameo, æquifoliato. Folia dissita, subdivergentia, cuneata, ultra ½ bifida, segmentis late subulatis, acuminatis; cellulæ minutulæ, pellucidæ, oblongo-quadratæ. Foliola nulla. Flores ♀ rari, in ramo pro m. brevi postico terminales; imperfecti solum visi, muco obtecti. Bracteæ serratæ. Perianthia trigona (imperfecta muco obruta).

Hab. Bolivia, loco Mapiri (No. 3,076)—Incomplete descripta attamen a *C. divaricata* certe distincta.—In eodem cespite, arcte intricata crescit *Marsupellæ* species, sterilis, olivacea, foliis duplo majoribus, subcomplicatis, ad medium solum bifidis, segmentis semi-lanceolatis, acutis vel subobtusis. Indescripta videretur.

PLAGIOCHILA, Dumort.

PLAGIOCHILA (§ SPINULOSÆ) MAPIRIENSIS, n. sp.

Dioica, rufescens; caules sesquipollicares, e caudice breviter repente suberecti flexuosi, parum ramosi. Folia approximata, opposita, decurvo-secunda, dimidiato-oblonga vel subovato-oblonga, obtusa vel truncata, utrinque decurrentia, margine antico recurvo integerrima vel sub apice 1–2-dentata, postico supra basin cuneatam integram apiceque paucispinoso-dentata, dentibus omnibus 8–15, inæqualibus, duobus apicalibus sæpe magnis; cellulæ mediocres subpellucidæ. Flores ♀ terminales, innovati. Bracteæ unijugæ, laxe involucrantes, foliis sat longiores, margine postico crebrius longiusque spinosæ, antico revoluto dentibus 1–3 armato. Perianthia (immatura) immersa cupulata, exalata, ore subbilabiato spinoso-ciliata, aliis ciliis longissimis.—Folia 2.5 × 1.4, 2.5 × 1.1, cellulæ $\frac{1}{14}$; perianthia 2.5×1.35^{mm}.

Hab. In Andibus Bolivianis, loco Mapiri alt. 5,000 ped. (sub No. 3,078.)—*P. oresitrophæ*, Spruce, e foliis oppositis affinis, ab illa certe distat foliis angustis paucidentatis, duplo longioribus quam latis.

P. ORESITROPHA, S. Hep. Am. et And. var. Yungas, alt. 4,000 ped. (No. 3,024). A typo Peruviano paulo differt foliis minus crebre ciliatis.

P. GYMNOCALYCINA, M. et N. var. SUBSIMPLEX, Syn. Hep. 32. Yungas, alt. 6,000 ped. (No. 3,048). "In Peruvia locis saxosis humidis sylvarum circa Moleto, et in sylvis excelsis

secus vias prope Chupe prov. Yungas" (Orbigny in herb. Montagne). The much narrower leaves, toothed only toward the apex, seem to mark this for a distinct species; but I have seen no perianths, and dare not separate it. From *P. Mapiriensis* it differs essentially in the alternate (not opposite) leaves.

P. MACRIFOLIA, Tayl. var. Yungas, alt 4,000 ped. (No. 3,051.)

P. RUTILANS, Lindenb. Yungas, alt. 6,000 ped (No. 3,047 p.p).

P. RUBESCENS, Lindenb. Yungas, alt. 4,000 ped (No. 3,018). A few stems mixed with *P. viminea*, n. sp.

P. TENUIS, Lindenb. Yungas, 6,000 ped. (No. 3,060.)

P. BIDENS, Gottsch. Ann. Sc. Nat. (1857). Caules perpauci sterilesque inter alias *Plagiochilas* visi.

PLAGIOCHILA (§SPINULOSÆ) GRACILICAULIS, n. sp.

Dioica, tenuis, flaccida, virescens, caule bipollicari vage paucirameo. Folia distantia, decurvo-subsecunda, basi utrinque (antice præcipue) longe decurrentia, dimidiato-ovato-lanceolata, apice truncato bidentata, dentibus triangularibus, dentulo uno alterove interdum sinu interposito, margine antico recurvo integerrimo vel sub apice 1–2-denticulato, postico prælate sed laxe recurvo (basi integerrima excepta) distanter et breviter spinoso-dentato dentibus omnibus 10-11, cellulæ parvulæ, pellucidæ, inferiores subelongatæ, trigonis vix ullis. Flores ♀ terminales. Bracteæ 2, foliis majores, magis spinoso-dentatæ, antice dentes paucos monstrantes, altera (interior) perianthio subcontigua, altera dissita. Perianthia subemersa cupulato-campanulata, exalata, ore compresso rotundato spinoso-ciliata.—Folia, 2.0×1.0, cellulæ $\frac{1}{10}$; perianthia 2.8×1.8^{mm}.

Hab. Yungas Boliviæ; inter *Plagiochilam Bolivianam* (No. 3,020) exemplaria pauca carpsi.

PLAGIOCHILA (§ASPLENIOIDEÆ) ALTERNANS, Gottsche, Mex. Leverm. 63, t. 7. var. ANGUSTIFOLIA, Spruce.

Dioica, flavo-viridis, caulibus tripollicaribus, assurgentibus, simplicibus vel ramum unum alterumve proferentibus. Folia magna, distiche explanata vel subconvexa, patentissima, late semiovato-oblonga, rotundata, basi breviter late cuneata, margine antico supra medium, postico toto (basi excepta) crebre minute spinuloso-denticulata, dentibus omnibus 25-30; cellulæ

mediocres, subæquilateræ, ad angulos vix subincrassatæ.—Folia 4.3×3.4^{mm}; cellulæ $\frac{1}{15}$–$\frac{1}{10}{}^{mm}$.

Hab. Prope Yungas Boliviæ, in ligno putrido. (No. 3,010)—*P. asplenioidi* (L.) persimilis, distat foliis crebrius et minutius denticulatis. *P. ovata*, G. et *calomelanos*, Spruce, folia basi semicordata, toto margine minute denticulata habent.—Ad eandem speciem referenda erit plantula in Costa Rica a cl. E. S. Hyde lecta; parum divergit caule ramosiore, foliis angustioribus (4.5×2.5^{mm}) sæpe decurvo-convexis, cellulis paulo majoribus; margine autem eodem modo denticulatis ceterisque caracteribus cum stirpe Boliviana congruit. Stirps originalis Mexicana folia habet rotundiora, numero dentium tamen, &c., &c., cum nostris bene convenit.

P. (GRANDIFOLIÆ) ADIANTOIDES, vars.—Yungas, alt 6,000 ped., Unduavi, alt. 8,000 ped. (Nos. 3,010, 3,012, 3,013, 3,015, 3,016, 3,021, 3,047 pro parte).—Some of these forms, notably Nos. 3,012, 3,013 and 3,021, approach the West Indian "*P. superba*," but are hardly separable from typical *P. adiantoides*; and the "*P. superba*" gathered by d' Orbigny "in Boliviæ locis udis silvarum inter Chupe et Yanacache" doubtless belongs to the same category. The original *P. superba*, founded by Nees on a plant gathered in the Mauritius by Sieber, however, seems distinct.

P. NOTARISII, Mitt. Yungas, alt. 4,000 ped. (Nos. 3,009, 3,011, 3,014). Cum forma æquatoriali archetypa convenit foliis prælatis, semicordato-triangularibus, paucidentatis, necnon perianthiis immersis late alatis, &c.; solum differt foliis paulo longioribus obtusioribusque.

P. HETEROMALLA, Ldng. var. foliis latis circumcirca fere denticulatis, dentibus sub 70. Mapiri, 5,000 ped. No. 3,019. The three forms described in Hep. Am. et A., distinguished namely by differences in the breadth of the leaves and in the degree of marginal dentation, belong to but one species. The toothing of the anterior margin is variable but never entirely disappears (as asserted by Lindberg). The presence or absence of a wing to the perianth is inconstant in all the forms.

PLAGIOCHILA (§ HETEROMALLÆ) IMPLEXA, L. et G. Hep. Mex. 76, t. XIII. Dr. Rusby gathered this species, mixed with

Herberta serrata, n. sp. at Unduavi (alt. 10,000 ft.), but only the male plant. It belongs to the § Heteromallæ, and agrees well with the description and figure in Gottsche's work. The leaves are smaller than in most of its congeners (1.2×1.0^{mm}) strongly secund and accumbent, suborbicular, but with the whole antical margin so strongly revolute that they seem almost dimidiate. The rounded, plane, postical margin is closely spinuloso-dentate, teeth about 20. Cells minute and opaque, thick-walled and subæquilateral, but near the axis in the lower half less minute and twice as long as broad. ♂ spikes medial and terminal, ovato-fusiform ; bracts monandrous.

Liebmann discovered this species on the volcano Orizaba, at 8 to 12,000 feet, or at nearly the same height as Rusby found it in the Bolivian Andes.

PLAGIOCHILA (§ HETEROMALLÆ) FRAUSA, Gottsch. var. BOLIVIANA, n. var.

Dioica, cæspitosa, rufo-flavens; caules 1–2-pollicares, stricti, ramos paucos alternos proferentes. Folia subimbricata, plus minus decurvo-secunda, subtransversa, basi utrinque (antice præcipue) decurrente amplexantia, prælate semiovato-triangularia (potius deltoidea) acuta, margine antico stricto, late (non autem valide) recurva, unde folia canaliculata ab infero visa, integerrima vel sub apice 1–2-dentata; postico (basi longa integra excepta) valde rotundato spinuloso-dentata, dentibus omnibus sub 12, brevibus peracutis; cellulæ parvæ, opacæ, trigonis auctæ.—Folia 1.8×1.5, cellulæ $\frac{1}{10}$.

Hab. Yungas Boliviæ, alt. 6,000 ped. (No. 3,048 p.p.)—*P. deltoidia*, Lindng., e Nova Zelandia, huic persimilis, folia habet majora, magis dimidiata, margine postico ab ipsa fere basi validius dentata. *P. Bahiensis* Lindng. caule flagellifero, foliis utroque margine apiceque rotundatis distat. In nostra, alii rami interdum videntur exparte exfoliati, pro flagellis autem vix habendi. *P. frausa* typica, Mexicana, folia habet paulo longiora, magis argute dentata, alioquin omnino conformis est.

PLAGIOCHILA (§ HETEROMALLÆ) VIMINEA, n. sp.

Dioica, elata, flavo-viridis, caulibus 2–3-pollicaribus, cæspitosis, e basi decumbente suberectis, strictis et quasi vimineis, subsimplicibus, raro fastigiato-ramosis, valde polyphyllis. Folia

parva, inbricatula vel solum contigua, plus minus decurvo-secunda, semicordato-rotunda, margine antico rectiusculo late recurvo longe decurrente integerrima, postico prælate rotundato recurvo-cristato apiceque rotundato distanter spinuloso-dentata, dentibus 6–10; cellulæ parvulæ, convexulæ, ambitu late opacæ, incrassatione angulari nulla.—Folia 1.9^{mm} longa (ab ipsa basi antica), 1.3 (a basi postica), 1.6 ^{mm} lata, cellulæ $\frac{1}{10}^{mm}$.

Hab. Bolivia, in prov. Yungas (No. 3,018) *P. bifaria* (Sw.) differt foliis angustioribus, ovato-oblongis, apice sæpe bicuspidatis.

PLAGIOCHILA (§FRONDESCENTES) RUSBYI, n. sp.

Dioica, elata, rufo-brunnea; caules e caudice repente a matrice liberi (penduli ?) tripollicares, ab ipsa basi eleganter pinnati, pinnis sub 12 cujusque lateris, brevibus (mediis ¼ pollicis longis), frondem lineari-lanceolatam sistentes. Folia latiuscule imbricata, patentia (ramea ad angulum acutum), utrinque basi longe decurrentia, late semiovata, subtriangularia, apice obtusa truncatave, margine antico recurvo sub apice 2–3-dentata, cæterum integerrima, postico (basi excepta) apiceque spinoso-dentata, dentibus omnibus numero 10-15, breviusculis, late subulatis, inæqualibus; cellulæ parvulæ, opacæ, pachydermes, mediæ axialesque paulo longiores. Foliola nulla. Flores non aderant.—Folia 1.8×1.25, cellulæ $\frac{1}{10}$.

Hab. In Andibus Boliviæ orientalibus, loco Mapirí (alt. 5,000 ped. m. Aprili, 1886 (No. 3,031).—*P. thyoides*, Hep. Am. And. huic subsimilis, elatior est; foliis magis confertis, longioribus, solum apicem versus spinuloso-denticulatis; foliolis posticis majusculis adjectis.—*P. abietina*, Nees, differt caule fibrilloso, foliis tota fere longitudine argute spinoso-dentatis.

PLAGIOCHILA (§ FRONDESCENTES) LIGNICOLA, n. sp.

Dioica, virescens, elata, caule tripollicari et ultra, robusto, pinnato et subbipinnato. Folia flaccida tenuia imbricata, distiche patentia, semiovato-triangularia, obtusata vel truncata, utrinque leniter recurva, basi haud longe decurrentia, dein postice sub abrupte dilatata et rotundata caulem transeuntia et vel appressa vel cristatim recurva, margine supra medium—antico sæpe solum versus apicem—denticulata, dentibus pro more parvis inæqualibus (numero circiter 12); cellulæ parvulæ pellucidæ, trigonis subnullis. Foliola nulla.—Folia 2.3×1.5, 2.0×1.2, cellulæ $\frac{1}{10}^{mm}$.

Hab. In situ Yungas Boliviæ, alt. 6,000 ped. ad ramos emortuos. (No. 3,022).—*P. deflexirama*, Tayl. distat caule duplo

longiore, ramis subsimplicibus, foliis semiovato-oblongis validius spinoso-dentatis.

PLAGIOCHILA (§ FRONDESCENTES) RUFOVIRIDIS, n. sp.

Dioica, e viridi rufescens, caule sesquipollicari pinnato, ramis rarius ramulum proferentibus. Folia imbricata, distiche patentia, semiovato-oblonga, basi subsemicordatâ caulem velantia vel recurvula, margine antico recurvo decurrente integerrimo vel denticulis 1–3 distantibus armata, postico distanter spinoso-dentata, apice subtruncato plerumque 4-dentata, dentibus omnibus 12–15 inæquilongis. Flores ♀ in ramis terminales. Bracteæ foliis subconformes, appressæ, antice serrulatæ, postice apiceque crebrius longiusque spinoso-dentatæ. Perianthia vix emersa, cuneata, compresso-obconica, oblique subtruncata, hinc ala perangusta integra percursa, ore dentibus parvis, crebris, brevisubulatis armata.—Folia 2.5×1.35 cellulæ $\frac{1}{15}$; perianthia 3.0×1.8^{mm}.

Hab. Yungas Boliviæ, aliis Plagiochilis et Lejeuneis immixta. (No. 3,050 p. p.) Stirps solitaria mihi adevat, ab affinibus omnibus sc. *P. distinctifolia*, cet., diversa videbatur.

P. DIVERSIFOLIA, L. et G.—Yungas, alt. 6,000 ped. (No. 3,063, 3,050 p. p.)

P. LÆTEVIRENS, Lindenb. var. ? Mapiri, alt. 5,000 ped. (No. 3,077).

P. DISTINCTIFOLIA, Lindenb. Yungas, alt. 4–6,000 ped. (No. 3,049, 3,050 p. p.)

P. XANTHOCHROMA, Spruce, Hep. Am. et And. Yungas, alt. 6,000 ped., fertilis. (No. 3,050 p. p.) As Dr. Rusby's specimens, although very few, possess good perianths, which were wanting in those I took as the type of the species, I add a brief description. As in the plant of Ecuador so in that of Bolivia, the leaves rapidly discharge their yellow coloring matter on being steeped in water, and remain quite bleached.

Folia utroque margine late recurva, in sicco tam revoluta ut distantia et pectinata videntur; alia apice bifidula, segmentis subspinuloso-denticulatis. Cellulæ materie colorante in aqua cito evacuatæ scariosæ restant.

Flores ♀ in ramis terminales. Bracteæ subbijugæ, basi perianthium amplectentes, dein late patulæ, foliis paulo majores, margineque postico magis spinosæ. Perianthia emersa, cuneata, compressa, exalata, ore obliquo subrotundato-truncato crebre

longeque dentato-spinosa.—Folia 2.65×1.1, 2.5×0.8, cellulæ $\frac{1}{16}$ bracteæ 3.1×1.35; perianthia 3.25×1.5^{mm}.

P. CRISPABILIS, Lindenb. Mapiri, alt. 5,000 ped. ♂ (No. 3,032).

PLAGIOCHILA (§ CRISTATÆ) BOLIVIANA, n. sp.

Dioica, flavicans, caule bipollicari, valido basi rhizomatoso, parce ramoso, ramisque flexuosis polyphyllis. Folia dense imbricata, distiche patentia, raro decurvo-secunda, prælate semiovata, truncato-3–5-(plerumque 4-) dentata, rarius rotundata; margine antico recurvo, subrecto, integerrimo, longisime decurrente; postico basi primum recto horizontali dein late rotundato integerrimo, cauli appresso vel sæpius cristato-recurvo, cetero margine paucidenticulata, dentibus parvis inæqualibus numero 10–15; cellulæ parvulæ subopacæ, pachydermes trigonis angularibus magnis. Foliola minuta, caule velata, polymorpha, nunc lineara bifida, nunc ad basin usque in lacinias 2–3 capilares fissa &c. Andræcia in medio ramo posita; bracteæ plurijugæ, foliis minores, julaceo-imbricatæ.—Folia 2.3×1.9, 1.8×1.4, cellulæ $\frac{1}{16}$^{mm}.

Hab. Ad Yungas Boliviæ alt. 6,000 ped. (No. 3,020). *P. punctualis*, G. Hep. Mex. 57. t. 10, huic similis differt colore viridis foliis longioribus et sat angustioribus, paulo magis dentatis, foliolis majoribus plurifidis.

P. ORBIGNYANA, Mont. Mapiri, alt. 5,000 ped. (No. 3,065) "In locis udis, ad radices Andium orientales loco, Moleto dicto, ad cortices arborum." (D'Orbigny).

LEIOSCYPHUS, Mitt.

L. SCHIZOSTOMUS, S. in Hep. Am. et And. 446. Yungas, alt. 4,000 ped. (No. 3,055). Etiam cum *Lejeunea filiformi Plagiochilisque* haud raro commixta.

LOPHOCOLEA, Dumort.

L. MURICATA, Nees. In *Lej. filiformi* (No. 3,069) rarissime repens.

L. TRAPEZOIDEA, Mont. Frustula sola inter *Plagiochilas* raro inventa.

LOPHOCOLEA QUADRIDENTATA, n. sp.

Dioica, luride purpurea, prostrata, caule pollicari vel longiore, vage paucirameo. Folia opposita, arctiuscule imbricata, hori-

zontalia, convexa, oblongo-quadrata apice truncato biapiculata, sinu lato recto vel parum lunato, margine antico stricto integerrimo, postico apicem versus leniter rotundato, ibidemque dentibus ciliisve 2 dissitis armato; dentibus omnibus 4, subæquidistantibus, subulato-setaceis, apicalibus 4 cellulas, lateralibus 7–9 cellulas longis; cellulæ medii folii majusculæ, subapicales duplo minores, omnes leptodermes pellucidæ. Foliola utrinque cum folio connata, profunde bifida, dein quadrifida, laciniis foliis plus duplo brevioribus, subulatis, flexuoso-acuminatis, divergentibus, integerrimis vel paucidentatis, laciniis 2 basalibus reflexis interdum adjectis. Flores ♀ in caule ramove terminales (juveniles). Bracteæ foliis validius dentatæ; bracteola maxima, primum bifida dein plurilaciniata laciniis subtortis. Pistillidia plurima subelongata. Perianthia —. Folia 2.5×1.8; cellulæ $\frac{1}{11}$; folioli laciniæ 1.0^{mm}.

Hab. In Andibus Bolivianis, alt. circiter 6,000 pedum, ut videtur sat frequens, ad rupes humidas cum *Sphagnis*, *Plagiochilis*, etc. repens; solum sterilis visa—(No. 3,008, 3,074).—Ad ramos tenuiores dens quartus s. infimus interdum deëst, et folium solum tridentatum fit, dentibus etiam abbreviatis.—A *Chiloscypho arguto*, N., insulis Malayanis etc. indigeno, quocum commutata fuit, tam generice quam specifice differt.

JUNGERMANIA.

JUNGERMANIA OPPOSITIFOLIA, n. sp.

Dioica, cæspitosa, inferne virescens, apice rosea; caules 1-2 pollicares graciles, subsimplices, subtus ad foliorum insertionem radicellis brevibus pallidis obsessi. Folia subimbricata, vel vix contigua, opposita nisi pro basi antica breviter decurrente fere transversa, assurgenti-secunda, laxe accumbentia, oblongo-orbiculata, leniter concava, integerrima, cellulæ parvulæ, subæquilateræ, facie tuberculoso-asperulæ, trigonis angularibus magnis. Foliola nulla. Flores — Folia .8×.65, cellulæ $\frac{1}{10}$^{mm}.

Hab. Bolivia, prov. Yungas (No. 3,045).—Folia plerumque exacte opposita, raro basi subconnata; solum in caulibus tenuioribus videntur folia superiora interdum subdislocata.—Cum *J. colorata* congruit habitu colore, &c.; multo tenuior tamen, foliis oppositis (nec alternis) minus decurrentibus, &c.

NOTEROCLADA, Tayl.

NOTEROCLADA ARHIZA, n. sp.

Dioica, virens, in ætate rubescens, caule 1-½ pollices longo,

subsimplice, in matrice arcte repente, prælato, tenui tamen, supra plano vel subdepresso, subtus vix convexulo et vel omnino arhizo vel raro e foliorum basi radicellas paucas minutas proferente. Folia plano-disticha, parum imbricata, succuba fere longitudinaliter inserta, inferiora latiora quam longa, ovato-rotunda, subapicalia paulo longiora et angustiora, oblique oblonga magisque erecta, omnia cellulis bistratis pro majore parte (medio præcipue) conflata; cellulæ magnæ, pellucidæ, superiores subæquilatero, 4-7 gonæ, mediæ inferioresque oblongatæ. Flores ♀ terminales (valde juveniles solum visi).—Folia 3.1×3.8, superiora 4.3×2.8, cellulæ subapicales $\frac{1}{16}^{mm}$.

Hab. Sorata alt. 10,000 ped., cum *Marchantia* mixta, sterilis. (No. 3,005 p. p.)—The few species previously known of this curious genus are notable for their numerous, long, thick radicles, in one species purple, in another white; but in this plant, which exactly accords with the other species in the character of its foliage, the stems are either entirely rootless or shew rarely one or two small fascicles of radicles reduced to mere papillæ.

SYMPHYOGYNA, Mont.

S. BRASILIENSIS, Mont. var. Yungas alt. 6,000 ped. (No. 3,059).—Specimens from South Brazil, and others from the Quitenian Andes, have the fronds mostly thin and unistratous nearly or quite up to the midrib; but in these of Dr. Rusby's, and others from the Antilles, the pagina is thickened for about half its breadth, 4 cells thick next the midrib, thence gradually thinning out; yet intermediate states occur. In color, the fronds vary from whitish-green to olive-purple—almost black on the midrib.

S. LEPTOTHELIA, Tayl.? Yungas, alt. 6,000 ped. (No. 3,007 a).

S. BRONGNIARTII, Mart. Frondes perpaucæ steriles inter *Plagiochilas* visæ.

METZGERIA, Raddi.

M. HAMATA, Lindberg. Yungas, alt. 6,000 ped., fertilis. (No. 3,007 b).

ANEURA, Dumort.

A. (MULTIFIDÆ affinis, sterilis). Sorata, &c. (No. 3,005 p.p. &c.)

DUMORTIERA, Nees.

D. HIRSUTA, N. var. IRRIGUA. **Yungas, alt. 4,000 ped.** (No. 3,006).

MARCHANTIA, L.

M. PLICATA, Nees? Sorata, alt. 10,000 ped. **(No. 3,005).**

M. CHENOPODA, L. Pl. ♀ fertilis. Yungas 4,000 ped. **(No.** 3,004); pl. ♂ eodem loco, Nos. 3,001, 3,002, 3,003.

M. *nova species*? Sorata, sterilis, cum ***Noteroclada*, (No.** 3,005).

AITONIA, Nees.

A.? *species*, sterilis. Sorata, alt. 13,000 ped. **(No. 3,000).**

FIMBRIARIA, Forst.

F. *species*, sterilis. Mapiri, alt. 5,000 ped. **(No. 3,088).**

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MEMOIRS

OF THE

TORREY BOTANICAL CLUB.

VOL. I. NO. 4.

ON SEEDLESS FRUITS.

BY E. LEWIS STURTEVANT.

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SEEDLESS FRUITS.

By E. Lewis Sturtevant, South Framingham, Mass.

If we seek in nature an occurrence which is distinctly prejudicial to the continuance and distribution of species, we find an illustration in seedless fruits. Unless correlated with a development or increase of other means of propagation, as by suckering, off-shoots or bulbs, seedlessness must eventually bring about the destruction of the variety which its advent marks. Hence, seedlessness is more apt to be noted in cultivated or protected plants. In nature we would suppose that seedless fruits would necessarily be confined to the restricted locality wherein they have originated, for it is only under man's care, as it would seem, that they can receive a general distribution, although the habit of a species towards seedlessness may cause similar variety originations in different localities. Hence it is with extreme surprise that we note the wide extension of *Acorus Calamus*, a plant that so rarely perfects its fruit that this has been seen by but few botanists.[1] Yet sterility is but the extreme of the partial sterility, or more or less fruitfulness, which is so constantly noted, and we cannot consider the causes of one without more or less considering the causes of the other.

The causes of sterility, either partial or complete, must be many and complicated. The various factors combined under the term season are an influential series, as we note the increased fruitfulness of various wild fruits in one season as against another;

1 Darwin, An. and Pl. ii. 207.

as for illustration, the dangle-berry, (*Gaylussaccia frondosa*) in a Massachusetts locality, bore little fruit in 1888, the bloom failing to form, while in 1889, in the same locality the shrubs were extremely prolific. We find excellent illustration of the effect of climate in Humboldt's statement that on the slopes of the mountains of Mexico and Xalapa, at 677 toises of height, the luxuriance of vegetation is such that wheat does not form ears; and in India, Firminger notes quite a large number of plants that rarely blossom or seed, such as *Convolvulus tricolor*, *Geum atrosanguineum*, *Hibiscus Rosa-Sinensis*, *H. liliiflorus*, etc. Brandis in his Forest Flora names also the *Populus alba*, *Bambusa Balcova*, etc., and Seemann in the Feejee Islands the *Dioscorea alata*. Such instances could be almost indefinitely extended. A correlation between tuber bearing and seeding also seems to exist. Thus the *Agave vivipara*, when grown in rich soil in India invariably produces bulbs, but no seed, while on a poor soil and under arid conditions the opposite result occurs.[1] The sweet potato in China, according to Dr. Fortune,[2] never yields seed; in our region the sweet potato never blossoms, or if at all very rarely, yet in Alabama it blossoms, but, as Dr. Newman writes me, when forwarding the bloom, that he had never known seeds to be formed. The potato was noted by Knight[3] as having varieties that do not bloom, and at the present time the majority of our cultivated varieties, while blooming freely, yield no fruit or seed. The sugar cane rarely seeds, and Darwin quotes testimony that it never seeds in the West Indies, Malaga, India, Cochin China or the Malay Archipelago, yet recently at Barbadoes sugar cane has seeded and the seed has yielded seedlings[4]. A most interesting case of barrenness has come under my own observation at Nonquit, Massachusetts, where a gold-striped form of *Spartina cynosuroides* has been sterile for two years, while the ordinary green form alongside has seeded abundantly. Hybridity may also be ascribed as a cause, and Darwin cites a number of instances, and quotes Kolreuter as expressing astonishment that

1 Royle. Trans. Linn. Soc. xvii. 563.

2 Darwin An. and Pl. ii. 206.

3 Hort. and Phys. papers, 321. Goodrich, Trans. N. Y. Ag. Soc. 1847, 447.

4 Agricultural Science, March, 1889, p. 58.

hybrids are not only frequently sterile, but show a strong tendency to develop gigantic or tuberous roots, and as almost invariably tending to increase largely by suckers. We must not, however, ignore those obscure observations wherein we note an influence of pollen in developing the ovarium, although incapable of developing the ovule, and Darwin's statement that "with an orchid, the *Bonatia speciosa*, the development of the ovaria could be effected by mechanical irritation of the stigma" has not received the attention from investigators that its importance deserves. Gærtner often insists, says Darwin, that the flowers of uttterly sterile hybrids, which do not produce any seed, generally yield perfect capsules or fruit, a fact which Naudin has repeatedly observed in the Cucurbitaceæ. It seems to be well ascertained that certain plants can produce not only fruit, but fertile seed, without having been subjected to the action of pollen. Thus, as good authorities as Quatrefages[1], says this is unquestionably true, and Hooker[2] quotes facts of this character from Spallanzani, Bernhardi, Ch. Naudin, Fresenius and Tenore, and Jussieu[3] and Darwin[4] express also their belief. Treviranus[5], however, states that a perfect development of fruits, but with barren seeds will take place with some plants without the process of fertilization.

There seems to exist in fruits a correlation between seedlessness and quality, especially when that quality is expressed by the term tenderness of tissue. In fruits of a fine quality, tenderness of the seed coating often seems a marked characteristic, as in grapes, where the seeds of the improved varieties are distinctly softer and more brittle than in those of the wild species; as in peaches and plums, where the tendency of a split stone is often noticeable in fruit of varieties of high quality. It certainly should not be overlooked that universal experience usually recognizes lack of hardiness in trees of the most highly improved and developed varieties. This idea of correlation between seedlessness and quality is by no means a new one. Thus Bacon[6] wrote,

1 Quatrefages, Metamorphoses of Man. 271.
2 Hooker, Journ. of Bot. ix. 53.
3 Jussieu, Cours element. de Bot. 1840, 463.
4 Darwin, An. and Pl. i. 484.
5 Lond. Hort. Soc. Trans. 1854, 112.
6 Bacon's Works, Bohn. Ed. i. 142.

(born 1651): "The making of fruits without core or stone is likewise a curiosity, and somewhat better, because whatsoever maketh them so, is like to make them more tender and delicate." With such authority is it surprising that the "Christian Advocate,"[1] properly a disciple of humanism or idealism rather than of realism, soberly says: "Fruit of all kinds may be grown without seed by reversing the cion—rooting the top end of the cion. * * * Apples are grown without cores, peaches without seed, and grapes, plums, cherries, blackberries and every other kind of fruit may be grown without seed by simply reversing the cion. Persimmons without seed are not to be excelled by any other fruit in this country when dried. Apples cooked without cores are delightful. Grapes have been raised for five thousand years without seed. Peaches dried whole without seed would be a hundred times better than those shaved up and dried. The seeding of cherries has been a great trouble to cooks." ! !

The taking the pith from the vine in order to produce seedlessness, received the approval, if not the trial, of the ancients, as we find directions from Democritus, Palladius, Columella, and the well-read Bacon[2].

In the present stage of this investigation, I prefer to give such facts and statements regarding seedlessness, mostly in fruit, used in the horticultural sense, that have come to my attention, allowing the facts to speak for themselves. If such a correlation between quality and seedlessness exists, as I infer, this presentation has a value in calling attention to a possible method whereby our cultivated fruits may be more improved, and wild fruits be more successfully brought into cultural use.

It may be proper to call attention in advance to the fact that as regards size of fruit, there seems to be no way of generalizing at present. In the bunches of our cultivated grapes the larger berries contain usually the most seed; in the banana, increase of size apparently accompanies seeding, and the opposite conclusion is stated by Balfour also in relation to the breadfruit as well as the banana.[3]

1 Quoted in the New York Analist, Sept. 1, 1885.

2 Democritus, Geopon. lib. 4, c. 7. Palladius, De re rust. Feb. c. 29. Columella, De arb. c. 9. Bacon, notes, l. c.

3 Balfour, Bot. 261.

APPLE. PYRUS MALUS, L. (ROSACEÆ).

The apple is a fleshy fruit consisting of the ovary and calyx. The outer skin or epicarp is composed of the epidermis of the calyx combined with the ovary; the fleshy portion is the mesocarp, formed by the cellular portion of the calyx and ovary; while the scaly layer forming the walls of the seed-bearing cavities in the centre, is the endocarp. The carpels lie towards the centre of the fruit and form the core, while the edible pulp is formed by the calyx, which is adherent to the exterior of the ovary.

The better varieties of the apple usually contain some abortive seeds, and are sometimes individually to be found seedless. As a rule, where there is a tendency to abortive seeds, the larger and finer the apple the greater the number of abortive seeds. Thus five Baldwin apples, weighing thirty ounces, had eleven plump and nine shrivelled seeds; five others from the same barrel, and weighing seventeen ounces, furnished twenty-five plump and three abortive seeds.

The ancients were acquainted with the fruits of but limited areas as compared with our knowledge of to-day, for transportation and travel were then difficult. However, a goodly number of varieties are named. Pliny[1] gives the names of seventeen kinds as known to the Romans. In the sixteenth century Cordus[2] describes thirty-four German sorts; Le Jardinier Solitaire, 1612, describes ten French varieties; Parkinson, in his Paradisus, 1629, names or briefly describes fifty-seven sorts; J. Bauhin, in 1650, figures fifty-nine varieties and describes seventy-four; Rea, in his Flora of 1665, describes twenty sorts; Ray, in his History, 1688, names seventy-eight; Quintyne, in the English edition of his Compleat Gardener, 1693, catalogues twenty-five; Zwingerus, in 1696, in his Kreuterbuch gives a list of two hundred and thirty-four apples; Langley's Pomona, 1729, describes thirty-nine; Miller's Dictionary, 1731, commends forty kinds; Knoop's Pomologia, 1760–'66, gives colored figures of two hundred and fifteen; Mawe's Gardiner, 1778, enumerates sixty-seven varieties; Don, in 1832, offers a list of one thousand three hundred and ninety-six distinct apples; Downing, in 1866, notices six hun-

1 Pliny, lib. xv. c. 15.

2 J. Bauh. Hist. 1650, i. p. 5.

hred and forty-three kinds; and the American Pomological Society in 1877, approves for culture three hundred and twenty-two apples and thirteen crabs.

Seedless apples were known to the ancient Greeks[1], and the Romans,[2] called such the *spadonium* of the Belgae. In the twelfth century, Ibn-al-awam[3], a Moorish-Spaniard, cites Abou'l-Khari, of Seville, who describes the *Schahaly* apple as producing no flowers, and the fruit containing no seed. Camerarius[4], in 1588, mentions apples without seed, but also quotes Throphrastus; Bauhin,[5] in 1623, quotes Camerarius, and the apple not flowering, yet fruit-bearing of Gesner, which doubtless was seedless. Parkinson,[6] in 1629, speaks of the "apple without bloom" neither a good eating nor baking fruit, and in 1640[7], speaks of the *Poma nana*, the same name Camerarius uses, as having no kernels within the core. In 1650 we have Gesner and Camerarius quoted by John Bauhin, the former describing his tree in the vicinity of Tiguri, the latter as *Poma nana*, and a wood-cut of the *Malus non florida dicta*, which he states is wont to be seedless.[8] This same figure, not accurately copied, is given by Jonston[9] in 1662, who apparently had not seen the variety, and a better copy by Chabraeus[10] who claims to have seen the fruit in the garden under charge of J. Bauhin; he calls it *Malus non florida dicta*, Gall. *Pommier sans fleur*. In 1665 the Hort. Reg. Paris, as quoted by Miller[11] had the *Malus fructifera, flore fugaci*, or fig apple. He had not seen a specimen himself, but refers to a letter written from New England by Paul Dudley, and published in the Phil. Trans. No. 385, as being of this kind. This letter[12] says, "This tree was no graft, and the fruit but ordinary

1 Theoph. de caus. pl. lib. 3 c. 23.

2 Pliny, lib. xv. c. 15.

3 Le lirve de l'Agric. d' Ibn-al-awam. Trad. par J. J. Clement Mullett, Paris, 1864, i. 308.

4 Cam. Hort. 1588, 95.

5 Bauh. pin. 1623, 433.

6 Park. par. 1629, 588.

7 Park. theat. 1640, 1502.

8 J. Bauh. Hist. 1650. i. 22.

9 Jonston, dend. 1662, p. 2, t. 2.

10 Chatraeus, stirp. sciag. 1677, p. 1; also ed. of 1666, p. 1.

11 Miller, Gard. Dict, 1731, art. malus.

12 Phil. Trans. 1724, 200.

for taste." In 1719 Tournefort[1] makes like reference to the Paris Garden, and gives as synonyms the *Malus non florida dicta* of J. Bauhin, and the common name *Pomme figue.* In 1768 Duhamel[2] describes the same variety, and in his second edition gives a figure of the fruit. In 1834 there was exhibited at the Massachusetts Horticultural Society's exhibition,[3] from Shrewsbury, Massachusetts, "A curious apple produced without blossoms, and having neither core nor seed." October 13, 1888, some "No Blow" apples were brought to the society by Mr. L. C. Durkie, of Northfields Farms, and these were identical in shape, but a little redder in color, than Duhamel's figure. I secured good colored drawings and dissections, and found them double-cored and seedless. The taste acid, crisp, sprightly, reminding of the Porter apple. December 15, 1888, O. B. Hadwin, of Worcester, informed me that the Shrewsbury seedless apple was well-known to him, and was the same variety as the "No Blow."

In 1778 Mawe[4] describes the Fig apple, and accounts for the name by the trees producing fruit without any visible flowers, like the Fig, but he adds that the tree does produce flowers that are visible, but almost apetalous. The *Pomme figue* is described, with Bauhin's and Tournefort's names as synonyms by Poiret[5] in 1804, and under the names *Pomme figure sans pepin* and *Pomme d'Adam* by Noisette[6] in 1829, who describes it as yellow striped with pale red, with firm and acid flesh. This fruit is also referred to by Ray,[7] in 1688, who but quotes from Bauhin's Pinax, and apparently by Joncquit, in 1659, under the name *Malus fructifera sine flore d'Robin.*

From this review it seems placed among the strong probabilities that many of these seedless apples were one and the same variety which has been continued through the years, and if so, illustrates either that it occasionally produces seed which continues the variety, or else that the present trees have been continued from grafts for over two thousand years.

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1 Inst. rei herb. 1719, 635.
2 Duhamel du Monceau, arb. fruit, 1768, i. 318; 2d ed. i. pl. 28.
3 Hist. Mass. Hort. Soc. p. 234. Mass. Hort. Soc. Rept. 1834, 22.
4 Mawe and Abercrombie, Gardener, under *Pyrus.*
5 Enc. method. bot. v. 562.
6 Noisette, Man. du Jard. 1829, 437.
7 Ray, Hist. 1688, ii. 1446.

Other remarks on seedless apples are those of Darwin,[1] who speaks of the curious St. Valery apple, in France, which although it bears fruit, rarely produces seed; that of the Bon Jardinier[2], which describes the *Sans Trognon de Menocher*, an excellent winter apple of the valley of Digomier, of which is said: "We do not know of a finer apple; it is well named coreless, for it has nothing within the skin which resembles a core, neither seed nor seed cells; it is excellent, of large medium size!"

As to causes, the apple becomes seedless in Jamaica according to Lunan,[3] apparently the effect of climate. In Knight's[4] experiment of grafting the apple on the pear, the fruit was seedless. In 1882 some Carolina Red Sour apple trees bore a second crop in Georgia, and these were seedless; "There was not the least evidence that any embryo had ever been present in the core or cavities of the endocarp."[5]

In a case reported in France[6] of a seedling apple one-half of which was red and acid, the other half green and sweet, suggesting hybridization, there was said to be scarcely ever a perfectly developed seed.

In counting the seed of a number of variety of apples, the following figures were obtained.[7]

Variety.	*No. of Specimens.*	*Average No. of Plump Seed.*	*Average No. Total Seed.*
Baldwin,	67	3.73	5.74
Bellefleur,	5	9.5	11.5
" Yellow,	2	8	8
Blue Pearmain	3	12	12.66
Greening,	1	4	7
" naked limb	1	10	10
" Palmer	1	3	3
" Rhode Island	6	6.87	11.21
" Winthrop	1	6	7
Gilliflower,	3	5	7
Grimes' Golden,	1	10	10

1 Darwin, An. and Pl. ii. 203. See also Bailey, The Bloomless Apple, Am. Garden, Jan. 1890, 6.

2 Bon Jardinier, 1882, p. xlvii.

3 Lunan. Hort. Jam. p. 24.

4 Phys. and Hort. Papers, 222.

5 Country Gentleman, Nov. 30, 1882.

6 Loudon's Gard. Mag. xiii. 230.

7 N. Y. Ag. Ex. Sta. Rept. 1882, 82; Proc. Soc. for P. of Ag. Sc. 1881, 114.

Variety.	*No. of Specimens.*	*Average No. of Plump Seed.*	*Average No. Total Seed.*
Hubbardson,	4	3.75	6.33
Hyde,	2	8.5	8.5
Jelly,	1	8	8
King of Tompkins County,	3	7.6	8.6
Lady Apple,	2	7	7
Northern Spy,	4	12.75	13.75
Pippin, Golden	2	4	7
" Monmouth	1	8	8
" Newtown	1	1	10
" New York	1	10	10
Russet,	1	6	8
" English	1	9	9
" Golden	3	3	7
" Gray	1	1	6
" Roxbury	4	3.25	8.66
Seek no Further, Westfield	1	16	18
Smith's Cider,	1	9	9
Spitzenburg,	3	6	7.6
" Esopus	6	10.7	11.1
Swaar,	1	13	13
Tolman Sweeting,	8	7.7	8.7
Vandevere,	1	9	10
Willow Twig,	1	10	11
Winter Blush, Tewksbury,	1	6	6

AVOCADO PEAR. PERSEA GRATISSIMA, GÆRTN. (LAURACEÆ).

There are several species or varieties of this fruit. Morelet[1] describes them in Central America; the *avocate*, the *omtchon*, and a third called *anison* on account of its flavor. In the normal plant the fruit is of the size of a large pear, and contains a large oval stone, which rattles when the fruit is ripe; the pulp is of a delicate coffee color, unctuous, without odor, resembling fresh butter. Long[2] mentions a green and a red sort in Jamaica.

In Ceylon the fruit is said to be smaller, harder, less buttery, thicker skined and more stony than in other climes.[3]

I introduce this statement among seedless fruit on account of the decrease of quality accompanying the *stony* seed, whatever that may mean.

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1 Travels, p. 265.

2 Jamaica, p. 808.

3 H. L. C. Gard. Chron. Apr. 19, 1884, p. 520.

AZAROLE. CRATÆGUS AZAROLUS, L. (ROSACEÆ).

This fruit is usually two-seeded, and when fully ripe is said to have an agreeable taste. It is esteemed in Italy and the Levant, where it is served at dessert. It is said to be much cultivated[1]. The fruit is cherry size, and is a pome resembling a very small pear. Duhamel,[2] says there are numerous varieties, the small yellow fruited, the small red fruited, and the large deep red fruiting. Noisette[3] mentions as varieties the fruit *longes*, *rouges* and *jaunes*.

Athenaeus[4], a Greek author of the second and third century, speaks of the Azarole as sweet and seedless. Darwin[5] mentions this plant amongst those in which the best varieties bear none or few seed.

BANANA. MUSA, SP. (MUSACEÆ).

The banana is a prominent instance of a seedless fruit. The fruit is composed of three adherent carpels surrounded by the external coat of the ovarium. There are very many varieties. Rumphius[6] says there are as many different kinds as there are of apples and pears in Europe. There are no fewer than thirty varieties cultivated by the natives of Tahiti, according to Ellis[7], besides twenty kinds, very large and serviceable that grow wild in the mountains. In Feejee, Wilkes[8] mentions five or six kinds besides the wild form, as cultivated. In India, Mueller[9] says about fifty distinct kinds are grown, and Firminger[10] enumerates twenty-one sorts under five species. Carey[11], however, says the cultivated varieties are infinite. Simmonds[12] estimates twenty varieties in Tenasserim, ten in Ceylon and thirty in Burmah.

1 Bot. Reposit. ix. pl. 579.
2 Duhamel du Monceau, arb. fruit, 1768, i. 325, fig. p. 334.
3 Man. du Jard. 1829, 444.
4 Sprengel. Hist. Rei Herb. i. 25.
5 Darwin, An. and Pl. ii. 208.
6 Rumph. Amb. v. p. 126, t. 60.
7 Polynesian Researches, i. 372.
8 U. S. Ex. Exp. iii. 333.
9 Mueller, Sel. Pl. 136.
10 Gard. in India.
11 Hort. Bengal. 18.
12 Trop. Agr. 457.

Forster[1] does not attempt to enumerate, but says the plantain varies almost *ad infinitum* like an apple. A few more quotations will suffice. Heuze[2] says the banana has produced fourteen varieties in Malabar, twenty-nine in Tahiti, fifteen in Tonga, sixteen in Malaysia and eighty in Batavia. On the Amazon, Castelnau[3] notes an enormous number of varieties, and Grant[4] mentions very distinct kinds in Central Africa.

This very abundance of varieties shows that the fruit must occasionally produce seed, and such instances are recorded. On the coast of Paria, near the Golfo Triste, Humboldt[5] says the banana is said to occasionally produce germinating seeds if the fruit be allowed to ripen on the stem. At Bordones, also, near Cumana, perfectly formed and matured seeds have been occasionally found in this fruit. Other examples of seeding are given as we proceed.

Musa ensete, Gmelin, is cultivated[6] in Abyssinia in large plantations for the inner portion of the stem and the young spike, which is used as a staple vegetable. Its fruit is dry and inedible, containing a few large stony seeds.[7] There are many instances given of other banana fruit containing seed. Burton[8], in Central Africa says the best bananas are grown by the Arabs at Unyamyembe, but poor specimens, coarse and insipid, stringy and full of seed; upon Lake Tanganyika there is a variety called *Mikono t'humbo*, or elephant's hands, very large, the skin brick-dust red, the pulp a dull yellow, with black seeds, and the flavor harsh, strong and drug-like. On the Coromandel Coast, Roxburgh[9] found both bananas and plantains under culture, and says the original wild *Musa* from which all the cultivated varieties of both plantain and banana proceed, bears numerous seeds. In the Himalayas, Hooker[10] notes two species of wild plantain, which ripen austere and small fruits which are full of seeds, and quite

1 Forster, Obs. 177.
2 Les. pl. alim. ii. 569.
3 Quoted by Herndon, Amazon, 181.
4 Speke's Nile, 583.
5 Views of Nature, 305.
6 Bruce, Voy. v., 50, t. 8 and 9.
7 Masters Treas of Bot. art. *Musa*.
8 Burton, Lake Region of Central Africa, 316.
9 Roxburgh, Coromandel Pl. iii. 74.
10 Hooker, Himalayan Journal, i. 143.

uneatable. At Manilla, Meyen[1] states that there is a variety of banana full of seeds. At Luzon, he says[2] there is a permanent variety, Platano de Pepita, propagated by shoots, and though it contains a great number of seeds, the pulpy substance of the fruit is exceedingly well flavored. In India, Cochin China and Java, this variety is also found, the fruit full of seeds, and therefore, less esteemed for eating. Finlayson[3] expressly mentions the cultivated *Musa* with perfect seeds, and on the island of Ubi he found a wild *Musa* with fruit full of seeds, and little edible pulp. At Batavia in 1790, Captain Cook[4] found the variety called Pissang Batu or Pissang Bidjie to be full of seed, but he adds that it had no excellence to recommend it to the taste, but the Malays use it as a remedy for the flux. At New Holland[5] he speaks of a variety of wild plaintain with seeds and well tasted, although on a previous page he says plantains are not found there. At another page he says these wild plantains were so full of stones as to be scarcely eatable.

Among the more definite mentions of seedy bananas, we may note *Musa glauca*, Roxb.,[6] native of Pegu, the fruit containing little else but seed, and scarcely fit for a monkey to eat. Royle[7] records *Musa Nepalensis* as apparently wild in Nepal, the fruit containing little else than the hard dry seeds. Loureiro[8] in Cochin China describes *Musa semenifera* in three varieties, one with seeds and scarcely any pulp, another with many seeds and a sweet pulp, the third which rarely seeds and the pulp very sweet. Roxburgh on the Coromandel Coast describes *Musa superba* as ripening seed, the fruit of no use, and *Musa troglodytarum* is described in Miller's Dictionary as having numerous seeds and inedible fruit. The same is said of its synonym *Musa uranoscopus* by Loureiro. On the contrary Mueller[9] says the edible fruits

1 Quoted by Darwin, An. and Pl. ii. 205, note.
2 Meyen, Outlines of the Geog. of Pl. London, 1846, p. 326.
3 Jour. of Voy. to Siam, 1826, p. 86.
4 Cook, Voy. i. 304.
5 Cook, Voy. i. 234, 235.
6 Roxburgh, Coromandel Pl. Plate 300.
7 Royle, Ill. of Bot. of the Himalayas, 355.
8 Loureiro, Cochin Ch. 644.
9 Mueller. Select Plants. under *Musa*, p. 136.

are small, reddish or orange colored, upright and edible, and by the context seedless; and at the Edinburgh Botanical Garden[1], *Musa superba* furnished a great quantity of high flavored, and from the context, seedless fruits.

Musa rubra, the *Vai* of Cook, and *Fahie* of Wilkes, grows both wild and cultivated at Tahiti. Wilkes[2] says it is destitute of seed, and praises the fruit very highly. Another authority[3] says there are five varieties, and still another[4] states that there are twenty sorts, found wild. Mueller l. c. seems to consider this species as synonymous with *Musa troglodytarum*.

The cultivated bananas and plantains have been assigned to quite a number of species, and furnish almost innumerable varieties, all of which are normally seedless, and all of which are described as more or less delicious for those kinds which are eaten raw.

BARBERRY. BERBERIS VULGARIS, L. (BERBERIDEÆ).

The fruit hangs in pendulous racemes, the berry a one-celled ovary containing from one to eight seeds. The culture is scarcely of sufficient importance to justify expectation of varieties, yet Duhamel[5] mentions the common red, the seedless, the purple, the white, the broad-leaved, the box-leaved, etc., and the black fruited of Tournefort, from the banks of the Euphrates, which, is said to be of a delicious flavor. The purple-leaved in ornamental gardening, is familiar to us all.

The first mention of a seedless barberry that we find is by Gerarde[6], in 1597. The second edition of his works in 1636, also speaks of it in the same words. "We have likewise another without any stone; the fruit is like the rest of the barberries, both in substance and taste." In 1601, Clusius[7] had seen this kind at a village near Frankfort, and he pronounces it by far the best sort for preserves. It is mentioned by name by Bauhin[8], in

1 Bot. Mag. quoted Gard. Chron. 1841, Mar. 20. p. 182.
2 U. S. Exp. Exp. ii. 28, iii. 333.
3 Voy. of the Novara, iii. 243.
4 Ellis, Polynesian Researches, i. 372.
5 Duhamel du Monceau, arb. fruit, 1768, i. 151.
6 Herbal. 1579, p. 1144; 1636, p. 1325.
7 Clus. rar. plant, 1601, i. 121.
8 Bauhin, pin. 1623, p. 454.

1623, and shortly by Parkinson,[1] in 1629 and 1640, who evidently had never seen it, and also is recorded by Coles,[2] in 1657, by name, by Jonston[3] in 1662 by name, by Ray,[4] in 1688, Tournefort,[5] in 1719, and Miller,[6] in 1731. In 1750, an anonymous French work on gardening[7] describes it as being the most desirable sort, and Duhamel,[8] in 1755, says it is subject to occasional seeding; in 1768 he[9] says it is the variety most deserving of culture. Mawe,[10] in 1778, just mentions it by name, and it is noted by Willdenow,[11] in 1799, by Poiret,[12] in 1808, Noisette,[13] in 1829, and is described apparently from Duhamel by Downing[14] in recent times. I have found occasionally seedless fruits on hedge plants in Maine.

It would seem that this stoneless fruit has been unknown in England and America, or at least not recorded, but has been grown in Germany, and we find it stated by several authors that it is especially valued about Rouen, in France, for the making of preserves.

BEECH NUTS. FAGUS FERRUGINEA, AIT. (CUPULIFERÆ).

The beech nut is usually abortive in South Framingham, Massachusetts, while the empty shells are in some seasons abundant, yet I have never seen there perfect seed. In other localities, the nuts usually appear plump and well filled.

BREADFRUIT. ARTOCARPUS INCISA, L. (URTICACEÆ).

The edible portion is formed by the cohesion into a single mass of the floral envelopes and ovaria of a large number of

1 Parkinson, parad. 1629, p. 561, theat. 1640, p. 1559.
2 Coles, Adam in Eden, 1657, p. 273,
3 Jonston, dendrog. 1662, p. 220.
4 Ray, Hist. 1688, ii. p. 1605.
5 Tournefort, Inst. 1719, p. 614.
6 Miller's Dict. 1731, under *Berberis*.
7 Les agremens de la Campagne, 1750, 159.
8 Duhamel du Monceau, Traite, 1755, i. p. 98.
9 Duhamel du Monceau, arb. fruit, 1768, ii. 151.
10 Mawe., Gard. 1778, under *Berberis*.
11 Willdenow, sp. pl. 1799, ii. p. 228.
12 Poiret, Enc. Meth. Bot. viii. p. 616.
13 Noisette, Man. du Jard. 1829, p. 448.
14 Downing, Fruits, 1866, p. 244.

flowers, arranged on a central fleshy column or spike. Rumphins[1] reports the tree wild in Banda. At Tahiti[2] they reckon no less than thirty varieties. In the Samoan group, Wilkes[3] says there are twenty varieties, and in the Feejee Islands nine different kinds distinguished by fruit of different sizes and shapes, and the figure of the leaves. Peschal[4] says that twenty-seven trees, which would about cover an English acre with their shade, are sufficient for the support, during the eight months of fruit-bearing of from ten to twelve people.

The earliest record of the breadfruit is by the writer of the account of Mendana's[5] voyage to the Marquesas Islands in 1595. It was again noted by Dampier,[6] in 1688, who in his description says there is neither seed nor stone in the inside. Seeding forms are, however, described by Sonnerat,[7] and by Rumphius,[8] the latter figuring the *Soccus granosus*, which contains seed, and the *Soccus lanosus*, whose cavity contained no seed except in one variety which contained a few seed. Forster,[9] 1786, makes two varieties, one seedless, the other seed-bearing. Of the first, he notes five different kinds, and of the second he remarks that on account of the superiority of the seedless kind, it has become neglected. Thunberg,[10] in 1779, says the fruit, the size of a child's head, sometimes has abortive seeds and sometimes none. Meyen[11] says the fruit generally contains seeds, and that by culture a number of seedless varieties have been formed. The seeds are said by Wilkes[12] to be often abortive in Tahiti. This tree came to Jamaica in February, 1793, and in 1814, Lunan[13] says that the varieties in Jamaica, save one, are seedless, and this ex-

1 Rumph. amb. 1, p. 113, pl. 33.
2 Enc. Brit. xviii. 280.
3 U. S. Ex. Exped. ii. 121; iii. 333.
4 Races of Man. 156.
5 Enc. Brit. xviii. 281.
6 Dampier, Voy. i. c. 10.
7 Sonnerat, Voy. 99, t. 57-60.
8 Rumphius, amb. i, 110, t. 32.
9 Forster, Pl. esc. 1786, p. 23, See also obs, p. 179.
10 Thunberg, Phil. Trans. 1779, vol.. 69, p. 465.
11 Meyen, Outlines of Geog. of Pl. 1846, pp. 322, 323.
12 U. S. Ex. Exped. ii. 50.
13 Lunan. Hort. Jam. 1814, i. 113.

ception has but a small number, and is not good unless baked. He says in Otaheite they reckon eight varieties without seed, and one with seed, but it is inferior to the others. Wallace[2] says that the seeds are entirely abortive by cultivation; he praises the taste and compares it to Yorkshire pudding; a friend said it was like mashed potatoes and milk. "It is generally about the size of a melon, a little fibrous towards the centre, but everywhere else quite smooth and puddingy, something in consistence between yeast dumplings and batter pudding. It is in no way as good as simply baked. With meat and gravy, it is a vegetable superior to any I know." The seed-bearing variety, he continues, is common all over the tropics, and though the seeds are very good eating, resembling chestnuts, the fruit is quite worthless as a vegetable.

CABBAGE. BRASSICA OLERACEA, L. (CRUCIFERÆ).

Although not a fruit, yet it is interesting to note the relation of the seed to the recognized quality. Thus arranging the races in the order of delicacy, we have the following table:

	No. of Var. or Trials.	*Wt. of* 100 *Seed in grains.*
Cauliflower,	24	4.55
Broccoli	4	5.03
Brussels Sprouts,	2	4.06
Cabbage, Savoy	8	5.08
" White	38	5.62
" Red	4	6.17

CHAMÆROPS STAURACANTHA. (PALMÆ).

This tree has the character of producing sterile fruit, but mixed with fertile on the same panicle. The pulp of the fruit is of a peculiar delicate, spongy consistence and of a pure white and shining on the outside. The fruit is oblong, about one inch in longest diameter. It has probably, says Prestoe,[1] been brought under a certain amount of cultivation from very remote times.

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2 Wallace, Malay Archipelago, p. 310.

1 Prestoe, Rept. Trinidad Bot. Gard. 1880, p. 39.

CHERRY. CERASUS VULGARIS, MILL. (ROSACEÆ).

The cherry fruit is formed by a change in the substance of the carpellary leaf. The internal surface of this becomes hardened into the stone or endocarp, whilst the external surface or epicarp remains as a thin cuticle or skin, and the pulp or mesocarp is formed by the increase of the parenchyma or fleshy tissue of the leaf. There is much confusion in the cultivated species. The *griottes* of the French belong to *Cerasus caproniana*, DC.; the *bigarreaus* to *C. duracina*, DC.; the *Merisiers* or wild, to *C. avium*, DC.; the *guigniers* or *geans*, to *C. Juliana*, DC. Don[1] gives eleven sorts referred to *C. avium*, sixty-one to *C. duracina*, and thirty-eight to *C. Juliana*. In all, he names two hundred and twenty sorts. The London Horticultural Society in 1832 recognized two hundred and nineteen varieties. In 1866 Downing describes one hundred and thirty-two sorts, and in 1887, the American Pomological Society approves of forty-one kinds as deserving of culture. In the first century Pliny[2] speaks of the Apronianan as the reddest variety, the Lutatian as the blackest, the Cœcilian as perfectly round, the Junianian as agreeable, but very delicate and not bearing transportation, the Plinianan as the finest, the Lusitanian and those of the Rhine, besides several of doubtful interpretation. The Rhine cherry, he says, has a third color, being a mixture of black, red and green, and has the appearance of being just on the turn to ripening.

In the Geoponics,[3] directions are given by Democritus for raising grapes without kernels, and he says the same method will produce seedless cherries. Martial, as quoted by Palladius[4], avers the same. I find, however, very little on seedless cherries in later writers. Knight[5] says he crossed the Morello and Common Cherry, and obtained five cherries from nearly as many thousand blossoms, and four of these did not contain seed. In the best varieties of the cherry, I have found many of the kernels to be abortive. thus:[6]

1 Gard. Dict. Vol. 2, p. 505.
2 Pliny, lib. xv. c. 30.
3 Geop. lib. 4, c. 7.
4 Pall. lib. 3. c. 29; lib. 11, c. 12.
5 Phys. and Hort. Papers, 277.
6 Rep. N. Y. Ag. Exp. Sta. 1882, p. 81.

Variety.	*Total Pits Examined.*	*Per Cent. Abortive.*
Black Tartarean	30	37
Elton	20	15
Governor Wood	30	50
Black Eagle	3	17
Burr's Seedling	30	93

In October, 1884, I had planted quite a large number of cherry pits. July 24, 1885, the following numbers were found vegetated:

Variety.	
Black Tartarean	3 per cent.
Elton	0 "
Black Eagle	22 "
Buttner's Yellow	19 "
Napolean Bigarreau	13 "
Yellow Spanish	4 "
Average	10

This limited data, supplemented by a large mass of unrecorded observation, leads me to believe that our improved varieties of the cherry are subject to partial sterility, which seems to be corelated with quality.

CITRON. CITRUS MEDICA, L. (RUTACÆ).

This is a large oblong or ovate fruit, the skin rough with protuberances, and of the well known citron color when ripe. There are very many varieties, some round, some oval, others oblate spherical, and others fingered. Very many fingered forms are figured by the early writers. It is a pulpy fruit with a spongy rind. It is supposed by many botanists that the citron, the orange, the lemon, and the lime, are all derived from this species[1]. Brandis and Sir Joseph Hooker distinguished four cultivated varieties: *Citrus medica*, the Cedratier of the French, the Citron of the English, the Cedro of the Italians, called *Vijapura* in Sanscrit; *Citrus medica Limonum*, the Citrionnier of the French, the Lemon of the English; *Citrus medica acida* (*C. acida*, Roxb.), called in Sanscrit *Jambira*; *Citrus medica Limetta* (*C. Limetta* and *C. Lumia*, Risso), the Sweet Lime.[2]

The Chinese citron, the cedrat of Florence, and several others

1 Lindley, Jour. of Hort. Soc., x. 171.

2 DeCandolle, L'Orig. des. pl. cult. 1883, 142.

which resemble them, are sterile or nearly so; the Ponciere is always seedless; the large orange citron has a thin and acid pulp, and never contains seed.[1] The Troon or Tabernacle citron is so highly prized at Mogador by the faithful observers of Israelite traditions, that specimens without blemish are sold at a very high price. It is rather larger than a lemon, and is said to contain only one pip, to be of a very fine nature, and to keep sound for a very long period.[2]

CUCUMBER. CUCUMIS SATIVUS, L. (CUCURBITACEÆ).

This fruit consists of three carpels united together and forming one cell, but having the ovules arranged on three lines which pass up the sides. It has been planted in gardens from most ancient times, and often appears as an escape in suitable climates, and has been described under a number of specific names[3]. There are many varieties. Ibn-al-awam describes five in Spain in the twelfth century. Parkinson in England, in 1629, describes six; L'Horticulteur Francais, 1824, names seven kinds; Noisette, in 1829, names or describes ten sorts; the New York Agricultural Experiment Station Report for 1887 describes twenty-six varieties under one hundred and thirty-two synonyms.

In the Geoponics, lib. xii. c. 19, directions are given how to raise cucumbers without seed, so also by Palladius, and seedless cucumbers are mentioned by Ibn-al-awam, a Moorish-Spaniard of the twelfth century. Loudon[4] says many persons prefer cucumbers which have not been fecundated, on account of the much smaller size of the seed integuments, which never contain kernels. These seedless cucumbers of the English Frame varieties frequently appear under forced culture in our greenhouses, and also when grown in the open air. In 1882 an advertisement of Sharpe's Epicurian Cucumber in the "Gardener's Chronicle," says it is "a variety that seldom produces seeds, not one in a hundred containing a trace." Large cucumbers of fine quality are usually little seedy. At the New York Agricultural Experiment Station in 1885, the following varieties contained but few seed as compared with the rest,

1 Gallesio, Citrus Family, Fla. Agr. Trans. p. 16.
2 Gard. Chron. Nov. 8, 1884, p. 601.
3 Cogniaux in DC., Monog. iii. 498.
4 Loudon, Hort. 1860, p. 495.

viz.: Vert long de Chine; Turkey Long Green; Peerless White Spine; Perfect Pickling; Large White Bonneville; and Carter's Best of All. In 1882 the English Frame Cucumber, Giant of Armstadt, was the finest flavored of all varieties tested, but contained no fertile seed.[1] In the glass culture for our markets seedless cucumbers are frequently found, and as under the conditions that seedless fruits occur the vines set badly, it is often the custom for the growers to place a hive of bees within the glass-house so that these insects may further the act of fertilization.

CURRANT. RIBES RUBRUM, L. (SAXIFRAGEÆ).

The berries are one-celled, and contain numerous seeds suspended in pulp by long threads. Thory[2] recognizes eight botanical varieties, the large-berried, the rosy-fruited, the white, the pearl, the variegated leaved, the white-nerved, the flowers in spikes, and the reddish. Duhamel[3], in 1768, describes the large red, the flesh-colored, the white and the pearl. Forsyth[4], in 1803, recognizes seven varieties; Thomas[5], in 1867, describes eighteen sorts, and Fuller[6] twenty-six.

The number of seed to the berry varies considerably in the currant. In some countings[7] the Cherry variety averaged 14.1 seed to a berry, but some extra large berries averaged 15.2 seed and one large bunch gave fruit with twenty seed. Some Red Dutch berries averaged 4.8 seed, and some White Dutch 9.8 seed. In some unreported observations, seedling plants were grown from seed taken from berries with few and many seeds. The plants from the very seedful fruits were larger, coarser and hardier than those grown from the few-seeding. The best fruit was found in the few-seeded, but not equal to the fruit of named varieties. The trial as regards corelation between seedlessness and quality was indecisive, yet full of suggestion. In the case of

1 Rept. N. Y. Ag. Ex. Sta. 1882, p. 126.
2 Monog. du genre Groseillier, 1829, p. 9.
3 Duhamel du Monceau, arb. fruit, 1768, i. 266.
4 Fruit Trees, Albany, 1803, p. 113.
5 Americam Fruit Culturist, 1867, 427.
6 Small Fruit Culturist, 1867, 203.
7 N. Y. Ag. Ex. Sta. Rept. 1882, p. 80.

the currant we have the largest berries containing the most seed, as is the case with the grape. In the same bunch berries may be found containing three to eighteen seeds.

CYCADS.

In Focke's work—Die Pflanzen Mischlinge—he states that female plants of Cycads often produce apparently perfect cones in greenhouses in Europe, yet their seed contains no embryo[1].

DATE. PHŒNIX DACTYLIFERA, L. (PALMÆ).

In the date the epicarp is the outer brownish skin, the pulpy matter is the mesocarp, and the paper-like lining is the endocarp covering the hard seed. This seed is composed of horny albumen with a groove down the front and the embryo placed at the back. The two sexes are borne on distinct trees, and the female tree is usually fertilized artificially. In India, Arabia, and elsewhere, this is done before the flower-spathes open, by boring a hole in the sheath of the female flowers and inserting therein a few bits of the male panicle[2]. Theophrastus was acquainted with this method, and Pliny also had knowledge of the necessity.

The fruit of the wild date consists more of seed than of pulp, and altogether is only about one-fourth the size of the Arabian kind brought annually to Calcutta for sale[3]. On the oasis of Sirvah, four kinds were seen by St. John[4], the Sultana, a long blue one; Farayah, white and said not to grow in Egypt; the Saidi, a common date; the Weddee, good only for camels and donkeys; also a very luscious yellow sort. Dr. James Richardson found no less than forty-six sorts cultivated in the oases of Northern Africa[5]. Those of Gomara, says Mueller[6], are large and contain no seed. Seedless dates are mentioned by Theophrastus[7], the third century before Christ, and by Pliny[8] in the

1 Gard. Chron. Apr. 14, 1883, p. 466.

2 Stocks, Hooker's Journ. of Bot. vii. 551.

3 S. N. Robinson, Jour. Agric.-Hort. Soc., ix. quoted by Firminger, Gard. in Ind. p. 172.

4 Adventures in the Libyan Desert, p. 188.

5 Archer, Profit. plants, p. 31.

6 Mueller, Sel. Pl. p, 162.

7 Theop. De plant. Bodaeus a Stapel ed. 1644, 90, 102.

8 Pliny, lib. xiii, c. 7.

first century, who says small fruit without seed are often found on the same shoots with others. At Maesaba, in Palestine, there is a date palm in a convent courtyard, said to have been planted by St. Saba, A.D., 490, which always bears stoneless fruit[1], and at Mooltan, India, there is one tree which bears a stoneless fruit, and in former years it was considered a royal tree and the fruit was reserved for the reigning sovereign[2].

DIOSCOREA ACULEATA, L. (DIOSCOREACEÆ).

The fruit of this yam, eaten by the common people of Malabar, according to Rheede,[3] has no seed.

DIOSPYROS MELANOXYLON, ROXB. (EBENACEÆ).

This species has an ovoid or globose yellow fruit, about an inch to an inch and a half in diameter, with yellow pulp, soft, sweet and slightly astringent. The seeds four to eight[4]. In India, Forsyth[5] mentions a cultivated variety without stones.

DIOSPYROS SCHI'TSE, BUNGE. (EBENACEÆ).

This large orange-colored fruit of northern China, as sold in the streets of Peking, according to Bretschneider,[6] is always aspermous.

FIG. FICUS CARICA, L. (URTICACEÆ).

This is an anthocarpous fruit, in which the axis or the extremity of the peduncle, is hollowed, so as to bear within numerous flowers, all of which are united in one mass to form the fruit. Dr. Presl[7] enumerates no less than forty varieties that are cultivated in Sicily. Dr. Robert Hogg[8] enumerates sixty-five. In the United States a leading firm of nurserymen[9] offer twenty-five varieties in its list. The London Horticultural Society's Catalogue[10] give forty-two varieties.

1 Gard. Chron. Jan. 23, 1886, p. 114.
2 Journ. Agri.-Hort. Soc. of Ind., 1867, Nov. 20.
3 Rheede, Malabar, vol. vii., p. 71.
4 Brandis, Forest Flora, p 294.
5 Highlands of Central India, p. 463.
6 Bretschn. Bot. Sin. 111.
7 Hooker's Journ. of Bot. i. 142.
8 Fruit Manual, 3d ed. p. 102.
9 Ellwanger & Barry, Desc. Cat. 1880.
10 Downing, Fruit, 1866, p. 290.

The flowers of the wild fig are used for the caprification of the cultivated fig in various parts of the East. This process was known to the ancients[1].

The cultivated fig bears two sorts of fruit; in the spring early figs or *fiorones*, and in the summer late figs. In the *fiorones* male flowers are very rarely found, and the few that may be present cannot serve for fecundation, for they do not appear until long after the stigmata of the female flowers are dried and destroyed. "I have never been able," says Prof. Gasparrini[2] "to find seeds with embryos in the *fiorones*." The summer fruit, on the contrary, have no male flowers, and yet nearly all of their ovaries become perfect, that is, furnished with embryos. Many kinds of figs, says Brandis[3], have sterile seed, that is, seed in which the embryo has not been developed, and therefore, fecundation is not an essential condition to the ripening of figs.

GOURD. LAGENARIA VULGARIS, SER. (CUCURBITACÆ).

Directions for making the gourd seedless are given in the Geoponics, lib. xii. c. 19, and Ibn-al-awam, in the twelfth century, a Moorish-Spaniard, mentions seedless gourds. Since the appearance of the pumpkin and squash, at the discovery of America, the gourd has scarcely been grown in Europe for edible purposes, and hence has been but little under observation.

GRAPE. VITIS SP. (VITACEÆ).

The grape is botanically a berry, an indehiscent fruit which is fleshy or pulpy throughout. The seeds nestle in pulp formed from the placentas. The berry is formed from the ovaries alone. All the true grape vines bear fertile flowers on one stock, and sterile flowers on another separate stock, and are, therefore, called polygamous, or not quite correctly, dicœcious. The sterile plants bear male flowers with abortive pistils, so that while they never produce fruit themselves, they may assist in fertilizing the others; the fertile flowers, however, are hermaphrodites, con-

1 Diosc. lib. 1. c. 184; Theoph. lib. 1. c. 8; Arist. U. An. lib. v. c. 26. See also Walpole's Turkey, xxiii. 241, note. Pliny, lib, xv. c. 19 and lib. xvii. c. 27.

2 Ann. des Sc. (III). t. 5, p. 306.

3 Forest Flora, p. 419.

taining both organs—stamens and pistils—and are capable of ripening fruit without the assistance of the male plant[1].

GRAPE. VITIS LABRUSCA, L.

In 1884 I saw bunches of the Wyoming grape which carried many seedless berries; the seedless grapes were small and ripe, with scarcely any toughness to the pulp, while the seeded berries were of the usual size and unripe. Professor Bailey[2] records an analagous example with a hybrid form. The larger part of the bunch bore fruit of the ordinary size, and the ordinary almost insipid flavor, but one bunch bore fruit about half as large, with thinner skin, an entirely different and better flavor and seedless.

On account of the uncertainty attending the classification of our cultivated varieties, I offer such notes as I possess under this heading. I am indebted to Professor E. S. Goff, of Madison, Wis., for assistance in this counting.

Variety.	*No. of Berries.*	*No. of Seed.*	*Av Seed per Berry.*
Vitis Labrusca, (Wild.)	521	1406	2.69
Vitis cordifolia, (Wild.)	75	191	2.54
Brighton, (Labrusca)	91	146	1.60
Catawba, (Labrusca)	385	825	2.14
Clinton, (Riparia)	184	280	1.52
Concord, (Labrusca)	719	1323	1.84
Delaware, (Lab. × Vinif. ?)	1311	1722	1.31
Iona, (Labrusca)	20	45	2.25
Isabella, (Labrusca)	55	88	1.60
Salem, (Lab. × Vinif.)	151	355	2.35
Vergennes, (Labrusca)	111	186	1.67

In a number of countings I have the material for arranging in another form: thus—

	No. of Berries.	*No. of Berries With*					
		0 Pips.	1 Pip.	2 Pips.	3 Pips.	4 Pips.	5 Pips.	6 Pips.
Vitis, Labrusca	521	0	84	138	172	112	8	7
Vitis cordifolia	75	0	13	25	20	17	0	0
Brighton,	91	2	46	31	10	2	0	0
Catawba,	355	0	85	158	99	13	0	0
Clinton,	184	0	89	89	6	0	0	0
Concord,	719	1	263	323	117	15	0	0
Delaware,	1311	5	934	329	42	1	0	0
Isabella,	25	0	14	10	1	0	0	0
Salem,	151	0	27	62	44	18	0	0
Vergennes,	111	3	49	41	17	1	0	0

1 Engelmann, Bushberg Cat., 1883, p. 9.

2 Bull. No. 31, Mich. Ag. Coll. 1887, 85.

In the case of these grapes, the largest berries have the most seed.

GRAPE. VITIS VINIFERA, L.

The Geoponics[1], as also Columella[2], gives directions for obtaining grapes without kernels, and Palladius[3] mentions a beautiful sort without stones, and Pliny[4] mentions the Rhætica, as possessing the thinnest skin of all the grapes and but a single stone. The description does not further suggest the Muscat of Alexandria grape, but specimens of raisins from these made in California, I found, in 1881, to contain but a single seed, with one other abortive remnant of a seed. In 1503-8, Ludovico de Varthema[5] found at Reame, a city of Arabia Felix, a white grape, which had no seeds within, than which, he says, I never tasted better. Parkinson[6], in 1629, says "the grape without stones is also a kind of it selfe, and groweth naturally neere Ascalon, as Brochard affirmeth, the wine whereof is redde, and of good taste."

The word "raysons of corannte" occurs in "The Forme of Cury" an English cook book compiled about A. D. 1390[7], and is the first reference I find to the Corinth grape. Dalechamp[8], in 1586, speaks of the *apurenoi*, that is, seedless, which are commonly called Corinth, and grow in the gardens of Italy and Piedmont. Modern authors describe the white and purple varieties of the Corinth grape as seedless, and this grape furnishes the "dried currants" of our kitchens. In California I am told that the Zante or Corinth grape so frequently seeds as to check the attempt to prepare this article of commerce, and that in Australia the same thing happens[9]. It would appear that this grape has been transmitted through cuttings for unknown centuries.

Among the grapes of Cabul is the "ungoor-i-Kishmishee" a fruit not large, round, transparent, seedless, sweet and luscious.

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1 Geopon. lib. 4, c. 7.
2 Col. de arb. c. 9.
3 Pal. de re rust, Feb. c. 29.
4 Pliny, lib. xiv. c. 4.
5 Travels of. Hakl. Soc. ed. p. 77.
6 Parad. 1629, p. 564.
7 Warner, Antiq. Culin. 1791. The Forme of Cury, Receipt, 14, etc.
8 Dalechamp, hist. gen. 1586, p. 1406.
9 E. J. Wickson, San Francisco, Cal., in letter of Feb. 13, 1880.

In Bulkh, the sweetest and best wine grape is called Kishmish; it is black, oval, of good size and seedless[1]. The white wine of Ispahan is made from a white grape called Kishmish, which has no pips[2]. Niebuhr[3] says the Arabians dry a small sort of grape called Kischmish which has no stone, but only soft and almost impalpable seeds. Pallas[4] says in Astracan, the Kyshmish or the grape without stones ranks first and is esteemed the best kind.

The Sultana grape in California is seedless, as Mr. Wickson informs me, and in the graperies of the Department of Agriculture at Washington, Mr. Saunders tells me it is also seedless. Arnold[5] speaks of the small stoneless grapes in Persia, which when dried, are sold as "Sultana" raisins, and praises their quality. The grapes of Eschol[6] have generally a transparent membranous seed, though some are said to have no seed at all, and Le Bruyn describes similar grapes without seed in Persia. In the Punjaub they have an indigenous stoneless grape called the Bedana[7].

The grapery of the late M. H. Simpson, of Saxonville, Mass., contains a seedless Black Hamburg vine, of which I have frequently eaten the fruit. The quality is exceptionally fine, but the berry is small. The brittle nature of the seed of our greenhouse grapes is familiar to all.

In counting the seeds of the *Vinifera* class of grapes, I have found:

Variety.	*No. of Berries Examined.*	*No. of Berries with*						*Seeds to a Berry.*
		0 Pips.	1 Pip.	2 Pips.	3 Pips.	4 Pips.	5 Pips.	6 Pips.	
Black Hamburg,	102	3	27	31	32	9	0	0	2.18
Morocco (Calif,)	126	3	83	32	5	3	0	0	1.38
Tokay, (Calif.)	268	13	83	100	46	21	4	1	1.97

GUAVA. PSIDIUM GUAYAVA, RADDI. (MYRTACEÆ).

In this fruit the seeds nestle in pulp formed by the placentas. The savory fruit, of the size of an apple, is highly relished in

1 J. Harlan. U. S. Pat. Off. Rept. 1861, 529, 534.
2 Redding quoted, U. S. Pat. Off. Rept. 1860, 367.
3 Travels through Arabia.
4 Travels, i. 313.
5 Arnold, Through Persia by Caravan, 151.
6 Calmet, Dict. of the Bible.
7 Firminger, Gard. in Ind. 212

many localities, and is eaten raw or made into a conserve. It is covered with a rind of some thickness, within which are the seeds contained in the pulp, without any shell. The contained pulp is of white, red or yellow color in the varieties, full of bony seeds, as Lunan remarks[1]. Its cultivation has been carried on by the primitive inhabitants of the main land of America from Mexico to Brazil, from time immemorial, says Unger[2], and it is frequently without seed.

KAKI, OR JAPANESE PERSIMMON. DIOSPYROS KAKI. (EBENACEÆ).

In California Mr. E. J. Wickson[3] writes that some Japan persimmons bear seedless fruit the first year, but the second year seeds appear. In a southern paper[4] the Zingi variety is stated to have buttery melting sweet flesh, and to be without trace of seed. C. C. Georgeson[5], in 1887, figures and describes twelve sorts in Japan, one sort with seed is described as "best"; one with the fact of seedlessness or otherwise, or quality not noted; two with seed not noted, but quality best; one, seed not noted, quality very good; three seedless, quality *best*; three seedless and quality delicious; one seedless, quality very good. J. B. Berckmans[6] figures and describes eleven varieties; of these one with seed is pronounced excellent; of two he gives no particulars; one, no statement regarding seed, but quality very sweet, and another with no mention of seed, quality good; of the seedless, one has no statement of quality, one is pronounced good, two are very sweet, one is excellent, and one is *best*. Mr. N. E. Vandeman[7] seems to be able to separate but three varieties in this country as sufficiently well recognized out of the confusion of very many names. Of these the Hachiya has numerous seeds, the quality below that of some varieties; the Tane-nashi is seedless, and one of the choicest sorts; the Yemon is seedless, and the best in

1 Hort. Jam. i. 350.
2 U. S. Pat. Off. Rept. 1859, 349.
3 Letter dated Feb. 13, 1880.
4 Southern Enterprise, Dec. 1880, p. 72.
5 Orchard and Garden, Oct. 1887, Figures.
6 Rural New Yorker, Oct. 8, 1887.
7 U. S. Dept. Ag. Rept. 1887, p. 643.

quality. In Japan there are recognized some fifty varieties, thirteen of which Henry Loomis[1] pronounces as constituting the leading sort. Of these the Yemon has some specimens seedless, especially when the trees are young. The quality seems to be excellent, superior to many, but not equal to the Gosho.

LAUREL CHERRY. PRUNUS LAUROCERASUS, L. (ROSACEÆ).

Bauhin in his Pinax, 1623, speaks of the *Cerasus folio laurino* as commonly having a stone fruit, but that at Trebizond there is a stoneless form. This species, a native of Trebizond, is said by Baillon[2] to have been introduced to Europe in 1576, and is abundantly cultivated in England and France. Its leaves are used for aromatic flavoring in cookery.

LEMON. CITRUS MEDICA, VAR. LIMONUM, L. (RUTACEÆ).

The common lemon, says Gallesio[3], contains many seeds. It produces hybrids and varieties that have few seeds, and sometimes no seeds, and it is always in those deviating most from the types that we remark this sterility. The double flowered lemon is a tree whose flowers have many petals, but are not entirely sterile. It has no seeds. In California, Carey's Eureka variety bears fruit nearly seedless, the rind thin and sweet, the pulp very juicy[4]. In South Africa, Thunberg[5] writes that he met with a lemon which contained another within it, furnished with a red rind, and that neither of these two lemons had any seed.

LIME. CITRUS LIMETTA, RISSO. (RUTACEÆ).

The lime of Naples, the fruit the smallest of European lemons, has a smooth, thin, odorous rind. Its pulp is abundant, its juice acid and agreeable because of its delicacy and aroma. It has no seeds, and as Gallesio[6] states, is one of the most highly esteemed lemons.

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1 Scientific Farmer 1879, p. 78.

2 Baillon, Hist. of Plants, i. 441.

3 Treatise on the Citrus Family. Florida Ag. Trans. pp. 16, 23.

4 Carey, Lecture on Orange and Lemon Culture, p. 14.

5 Travels, ii. 141.

6 Gallesio, Treatise on the Citrus Family, p. 24.

LOTOS. ZIZYPHUS LOTUS, DESF. (RHAMNEÆ).

Theophrastus[1] says the lotos without stones is the best. Pliny[2] says that the fruit which has no stone in the inside is the best. Decandolle identifies this lotos with *Zizyphus lotos*, Desfont. This fruit is of the size of sloes, containing large stones[3], and is an important article of food in Tunis and Barbary. The Arabs are excessively fond of it, and Park in Africa describes the small farinaceous berries as of a delicious taste. Consult Sprengels Hist. Rei Herb. p. 22, 83 and 251.

LUCUMA BIFERA, MOL. (SAPOTACEÆ).

This Chilian tree, according to Molina[4], bears fruit twice a year. The one set early in summer, have no kernels; the other set in autumn have two kernels. It is cultivated.

MALAY APPLE. EUGENIA MALACCENSIS, L. (MYRTACEÆ).

This tree is cultivated in the Indian Archipelago, the Pacific Islands, China, India, etc[5]. Firminger says the fruit is of the size and form of a very small apple, perfectly smooth, of a pure translucent white with a crimson blush, that some persons eat it, but that it is not worth the eating. Cook[6] says the fruits at Batavia are pleasant and cooling, but not possessing much flavor. Seemann describes the flavor as delicate: Lindley says when well ripened, delicious. Louriero commends it in Cochin China. There are apple-shaped, quince-shaped and pear-shaped varieties mentioned. Bauhin in his Pinax, 1623, mentions a stoneless variety.

MANGO. MANGIFERA INDICA, L. (ANACARDIACEÆ).

Of this fruit there are numberless varieties, differing in color, form and savor as do the pears and apples of Europe, says Loureiro. In some of its varieties it is esteemed delicious. About

1 Theop. Hist. pl. lib. iv. c. 4.
2 Pliny, lib. xiii. c. 32.
3 Don. Gard. Dict.
4 Molina, Hist. nat. du Chili, Paris, 1789, p. 169.
5 Firminger, Gard. in India, 265.
6 Cook, Voy. i. 305.

A. D., 1300, Friar Jordanus[1] says it "is a fruit so sweet and delicious as it is impossible to utter in words." Acosta[2] says that a stoneless variety is found, which is especially grateful to the palate. Garcia ab Horto[3] somewhat earlier records a variety called *Guzarateus* on account of its excellence, somewhat smaller than the common sorts, yet superior in savor and odor, and having a very small nut or stone. Rumphius[4], in 1741, describes the best variety in Amboinia as having a small stone. The mango differs greatly in its varieties, and while some receive the highest encomium, others resemble in taste, as is commonly said, a mixture of tow and turpentine. In India it seems to occupy the place that apples do with us.

MANGOSTEEN. GARCINIA MANGOSTANA, L. (CLUSIACEÆ).

The first mangosteen which ripened in England was of the size of a St. Michaels orange. It was of a deep plum color, and upon being opened was found perfect in every respect except the formation of seeds, of which there was no trace. Its quality was delicious[5]. F. W. Burbridge[6] says that in its wild state the interior of the fruit consists of four divisions only, all four containing each a perfect seed, whereas in the much larger cultivated fruits there are seven or eight divisions, and of these rarely more than one contains a perfect seed. Rumphius[7] says that some segments in the cultivated fruit are often seedless, and that frequently some fruit contain no fertile seed.

This fruit is deemed by many the most delicious fruit of the world. Bayard Taylor thus describes it: "Beautiful to sight, smell and taste, it hangs among its glossy leaves, the prince of fruits. Cut through the shaded green and purple of the rind, and lift the upper half of it as if it were the cover of a dish, and the pulp of half-transparent, creamy whiteness stands in segments like an orange, but rimmed with darkest crimson where the rind

1 Marvels described by Friar Jordanus. Hakl. Soc. ed. p. 14.
2 Acosta. Aromaticum, 1582, p. 70.
3 Aromatum, 1567, 217.
4 Amb. 1741, i. 94.
5 Gard. Chron. 1855, p. 259.
6 Gard. Chron., Jan. 5, 1884, p. 23.
7 Amb. i. 132.

was cut. It looks too beautiful to eat; but how the rarest sweetest essence of the tropics seem to dwell in it as it melts to your delighted taste."

MEDLAR. MESPILUS GERMANICA, L. (ROSACEÆ).

Duhamel[1] describes and figures a medlar without seeds, and says it is preferred as being more delicate and of a softer texture than the common kind. Noisette[2] speaks of it as a singular fruit, but small and of mediocre quality. Don[3] mentions the stoneless medlar as bearing a small fruit of little merit, and Loudon[4] gives the same description. In 1880 a French nursery catalogue advertises a variety of medlar under the name of "Stoneless."[5]

MELON. CUCUMIS MELO, L. (CUCURBITACEÆ).

Melons of the highest quality contain fewer seed than do varieties of medium or inferior quality, as I have often observed. This even seems to hold true as between individual fruits of the same variety to a marked extent. Cæsalpinus, in 1538, notes that melons with small seed are the best for eating. In four varieties selected for their high quality, the following particulars were obtained.

Variety.	*No. of Spec.*	*Av. No. of Seed.*	*Av. Wt. of Seed Grs.*	*Av. Wt. of Fruit Grs.*	*Per Cent. of Seed.*
Christiana,	3	512	234	18,621	1.25
Hackensack,	1	550	273	29,181	.93
New Surprise,	3	530	231	12,443	1.85
Shaw's Golden Superb,	1	494	203	12,632	1.60

MULBERRY. MORUS ALBA, L. AND VAR. NIGRA, L. (URTICACEÆ).

The edible portion of the mulberry is formed by the cohesion into a single mass, of the floral envelopes and ovaries of a large number of flowers arranged on a central fleshy column or spike, the calyces becoming succulent, and investing the pericarps. In

1 Duhamel du Monceau, arb. fruit. 1768, i. 331.
2 Noisette, Man. du Jard. 1829, 439.
3 Don. Gard. dict. 1832, ii. 605.
4 Loudon, Hort. 552.
5 Transon Bros. Orleans, France. Cat. of 1880-1.

Asiatic countries the fruit is held in esteem. In Kashmere and Afghanistan, says Brandis[1], there are varieties sweet and acid, of all shades of color from a white to a deep blackish purple. Downing[2] describes one cultivated variety of *M. rubra*, one of the *M. nigra*, and one the Everbearing, derived from *M. multicaulis*. The fruit of several other species are, however, valued in the Orient.

Forskal[3] notes about Constantinople the cultivated mulberry as having a succulent pulp and few seeds. Brandis[4] quotes Stocks that in Beloochistan there is a seedless variety called *Bedana*. Schuyler[5] says that in Turkistan the Khorasmi mulberry from Khiva, large white, almost seedless, is greatly used for food both when fresh and dried. Harlan[6] says that in the markets of Cabul, the white-seeded mulberry or Shah-toot, the thickness of the small finger, is very sweet, and in its season forms the chief food of the poor. It is a grafted fruit.

Myrtle. Myrtus communis, L. (Myrtaceæ).

The fruit of the myrtle is eaten by the modern as it was by the ancient Athenians[7]. It is, however, of little prominence in the cookery of even southern nations. Camerarius[8] speaks of a tree that produced fruit without seed.

Olive. Olea Europœa. (Oleaceæ).

The recent prominence given to olive culture in California, has brought to view some facts concerning the corelations of seedlessness with quality. The following is taken from the bulletin of Feb. 15th, 1890, from the University of California Agricultural Experiment Station, (No. 85).

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1 Forest Flora, 407.
2 Fruits, 1866, p. 347.
3 Forskal, fl. Aeg. Arab. 1775, p. xxxiii.
4 Brandis, Forest Flora, p. 408.
5 Schuyler, Turkistan, i. 196.
6 J. Harlan, U. S. Pat. Off. Rept. 1861, 529.
7 Hogg, Jour. of Bot. i. 117.
8 Camerarius, Hort. med. 1588, 95.

Dimensions in 16ths of an inch.

Variety of Olive.	*Whole fruit.*		*Pit.*		*Pit per cent.*
	Length.	*Width.*	*Length.*	*Width.*	*by bulk.*
Regalis,	17	13	9	5	7.8
Manzanillo No. 1,	16	13	9	5	8.3
Nevadillo Blanco,	16	10	10	4	10.0
Pendulina,	12	9	7	4	11.5
Columella,	14	11	8	5	11.8
Mission,	16	10	10	5	15.6
Polymorpha,	19	12	12	6	15.8
Rubra,	12	8	8	4	16.7
Rock's Oblonga,	15	8	11	4	18.3
Redding Picholine,	8	6	6	4	33.3
Uvaria,	13	9	10	6	34.2

ONION. ALLIUM CEPA, L. (LILIACEÆ).

The top-onion may be mentioned as a plant not bearing seeds, yet I have often observed a few seeds arising from among the bulbs. In one case an onion of the ordinary sort became injured in the stalk. From the split a cluster of bulbs protruded, and the "top" failed to produce seed.

OPUNTIA. (CACTEÆ).

Opuntia Davisii, Engelm., is common on the Upper Canadian, near the Llano Estacado, Tex. All the fruits observed were sterile, and most of them elongated, one to one and a quarter inches long, as Engelmann states[1]. In Sicily a variety of *Opuntia Ficus-indica* has fruits without seeds[2].

ORANGE. CITRUS AURANTIUM, L. (RUTACEÆ).

This fruit is botanically a hesperidium, or a berry with a leathery rind. It consists of the carpels surrounded by the external coat of the ovarium, and having the space between their inner wall and the seeds they contain filled with a very succulent

1 Engelmann, Pac. R. R. Report, iv. 49, Fig. pl. xvi.

2 P. L. S., Gard. Chron. Aug. 9, 1884. p. 171.

cellular tissue. The rind consists of epicarp and mesocarp, while the endocarp forms partitions in the interior filled with pulpy cells which are produced from the inner lining of the pericarp. There are many varieties. In Sicily[1] fourteen kinds are recognized; Loudon[2] mentions nineteen; Downing[3] twelve; Gallesio describes forty of the principal kinds cultivated in Italy. The varieties named in Florida and California are very numerous, and some as the mandarin and tangerin have been described as species.

Gallesio asserts that in cross-breeding oranges, often monstrous fruits were produced, which included "little pulp, and had no seeds or imperfect seeds." Darwin,[4] in commenting upon this, states that a myrtle-leaved orange in his father's greenhouse, during many years rarely yielded any seed, but at last produced one; and the tree thus raised was identical with the parent form. D. J. Browne[5] speaks of the varieties of orange, some with a navel-like protuberance with no seeds. This appears to be the the Navel or Bahia variety, which in the State of California is perfectly seedless[6], as also in Florida, as I have myself observed. Mr. H. E. Vandeman[7] speaks of the variety as being almost entirely seedless. Another seedless orange in California is Garey's Mediterranean Sweet; it is of large size, excellent flavor, very delicate texture, and the larger number are entirely seedless[8]. A Japanese orange, the *Mushin Tane Nashi Mikaw* is said[9] to bear a seedless fruit on a thornless tree. The St. Michael orange is also of the seedless kind. Dr. Balfour[10] states that the thinness of the rind and its freedom from pips depend on the age of the tree. The young trees when in full vigor bear fruit with a thick

1 Hogg, Hooker's Jour. of Bot. i. 106.

2 Hort. p. 608.

3 Fruits, 1860, p. 691.

4 Darwin, An. and Pl., i. 405.

5 U. S. Pat. Of. Rept. 1858, 266.

6 E. J. Wickson, Ed. of Pac. Rural Press, in letter of Feb. 13, 1880.

7 U. S. Dept. Ag. Rept. 1887, 641.

8 Pacific Rural Press, Aug. 1877.

9 South Cal. Hort. Jour. 1878, p. 292.

10 Balfour's Botany, p. 280.

pulpy rind and abundance of seed, but as the vigor of the tree declines, the peel becomes thinner and the seeds gradually diminish in number till they disappear altogether. Browne[1] says the St. Michael orange, one of the most delicious of all varieties, is known by its small seedless fruit. Loudon[2] says this variety is generally without seed and Downing[3] says the pulp is often seedless, juicy and lusciously sweet.

Seedless oranges were known several centuries ago. Bauhin[4], in 1623, refers to the "*malus aurantia major * * * alia absque semine sunt*," and Ferrarius[5], in 1646, describes and figures a seedless orange as does also Aldrovandus in 1668. The Navel or Bahia, with synonyms Washington Navel and Riverside Navel, certainly ranks as the most delicious sort. In a wild orange grove near Matanzas Inlet, Florida, in 1869, I found one wild orange tree bearing fruit with a sweet pulp and bitter rind; this contained fewer seed than did the bitter oranges adjoining.

In counting the seed of some oranges in 1881 and 1882, the varieties were sorted according to quality before the counting was concluded. The following figures were obtained:

	No. of Spec.	*Av. No. Good Seed.*	*Av. No. Abortive Seed.*	*Wt. of Seed Grs.*
Florida Orange, tender	5	6.2	0.8	18.6
" tough	2	11.0	1.5	47.7
Valencia Orange, tender	15	8.8	1.6	29.8
" " tough	10	12.8	1.5	40.0
Messina Orange, good	1	4.	2.	19.

OTAHEITE APPLE. SPONDIAS DULCIS, FORST. (ANACARDIACEÆ).

The Otaheite apple, says Forster[6], which contains a hard cap-

1 Trees of Am., 59.

2 Hort. p. 608.

3 Fruits, p. 694.

4 Bauhin, Pinax, 1623, 436.

5 Hesperides, 1646, lib. 4, c. 4, p. 383. Aldrovandus, Dend. 1668. 488.

6 Forster, obs. p. 179.

sule, commonly has no seeds in the locuments or divisions. Ellis[1], however, says it has a hard and spiked core, containing a number of seed. He calls it an excellent fruit. Forster in his De Plantis Esculentis says the seeds are solitary, ovate, compressed, usually abortive, thus recognizing both states of seeding and seedless. Firminger[2] says he is told that in India the stones never germinate, but young plants are usually obtained by grafting upon seedlings of *Spondias mangifera*, another species.

PEACH. AMYGDALUS PERSICA, L. (ROSACEÆ).

It seems to be a general rule that the sweetest, honiest peaches have usually a split stone. Africanus in the Geoponics[3], give directions how to raise the peach without stones.

PEACH PALM. GULIELMA SPECIOSA, MART. (PALMÆ).

The peach palm, says Humboldt[4], bears a fruit which is generally devoid of seed, owing to the extreme luxuriance of the vegetation. He[5] also says that the *piritu* or *pirijao* palm bears clusters containing from fifty to eighty fruit, yellow like apples, and purpling as they ripen, two or three inches thick, and generally, from abortion without a kernel. Seemann[6] says in most instances the seed is abortive, the whole fruit being a farinaceous mass. Occasionally, however, fruit are found containing the perfect stony seed, and they are then double the usual size. The tree is not found wild in the Amazon districts, but is invariably planted. Bates[7] says bunches of sterile or seedless plants sometimes occur at Ega and at Para. It is one of the principal articles of food at Ega while in season, and is boiled and eaten with treacle and salt. Prestoe[8] says the tree is extremely prolific, bearing two distinct crops a year, and sometimes more. At one season all seedless fruit are produced, and with a greatly enlarged fruit pulp, while at the other season only seeded or fertile fruits are produced. The

1 Ellis, Polynesian Researches, i. 374.
2 Gard. in India, p. 234.
3 Geop. lib. x. c. 16.
4 Views of Nature, p. 161.
5 Humboldt, Trav. ii. 336.
6 Popular Hist. of Palms, p. 208.
7 A Naturalist on the Amazon, p. 268.
8 Rept. of the Bot. Garden of Trinidad, 1880, 39.

seedless fruits are highly appreciated by all classes, both unripe as well as ripe.

PEAR. PYRUS COMMUNIS, L. (ROSACEÆ).

This fruit is botanically a pome, a fleshy fruit with the calyx adherent, and forming along with the epicarp or skin and the mesocarp or pulp, a thick cellular mass which is eatable, while the endocarp is scaly or horny, and forms separate cells enclosing the seeds. Its varieties are exceedingly numerous. Pliny[1] enumerates forty-two kinds as known to the Romans, and Columella[2] names eighteen sorts. Macrobius[3], as quoted by Gesner, also furnishes a list, from which Gesner[4] quotes with other Roman authors as furnishing twenty praiseworthy varieties. In Tuscany, in the times of the Medici there were catalogued two hundred and thirty-two kinds[5]; Le Jardinier Solitaire, 1612, describes fifty-five varieties in France; Meager, in his English Gardener, 1683, gives a list of one hundred and five; Knoop, in his Pomologia, 1760–6, figures one hundred and eighty-four kinds in color; Mawe, in his Gardeners' Dictionary of 1748, enumerates ninety-five; Don, in his Gardeners' or Botanists' Dictionary, 1832, gives a classified list of six hundred and seventy-seven sorts; Field, in his Fruit Culture, 1886, offers a catalogue of eight hundred and fifty varieties, of which six hundred and eighty-three are of foreign and one hundred and sixty-seven of American origin.

The more delicate varieties of pears, such as the Gansel's Bergamot and the Chaumontelle, says Lindley[6], have rarely any seeds. On the other hand, R. Manning, deservedly a high authority on pears, tells me that certain varieties, such as Vicar of Wakefield and Beurre Diel have most of the seeds abortive, and the first named is not a delicate pear. The coreless pear[7] is frequently destitute of seeds, but always contains the cells. The flesh is apt to decay at the core. It is a good bearer, but the fruit is ex-

1 Pliny, lib. xv. c. 16.
2 Col. de re rust. lib. v. c. 10.
3 Saturnalia, 2. 15.
4 Gesner. Lexicon Rusticum, 1788.
5 Targioni-Tozetti, Hort. Trans. 1854, 159.
6 Lindley. Theory of Hort., 1859, p. 170.
7 Gard. Chron. 1843, 737.

tremely liable to be shaken down by the wind; a very fine baking pear. Another account[1] states that many varieties occasionally are devoid of seed, but Belle de Bruxelles or the Poire sans Pepins is always so. An account is also given of a Chaumontel pear which bears seedless crops.

Second crop pears are invariably seedless, says R. Manning. I have always found them so whenever I have had opportunity for examination. An instance is given[2] of second blooming bearing double flowers, and I have observed the same in the case of strawberries in autumn bloom. On February 17, 1880, N. Plumadore, of Raleigh, N. C., writes me that some third crop pears were entirely seedless, having nothing but a small stem-like thread clear through the pear. The Poires sans pierre was mentioned by Estienne[3] in 1570. The Bessemiawka, a Russian fruit of recent introduction, is nearly or quite seedless[4].

I have counted the seeds in but a few pears. The figures follow:

Variety.	*Number of Specimens.*	*Av. Wt. of Fruit. Ozs.*	*Av. Wt. of Seed. Grs.*	*Av. No. Plump Seed.*	*Av. No. Total Seed.*
Buffum,	5	2.9	6.17	6.2	10 0
Flemish Beauty,	1	5.5	7.71	4.0	6.0
Nowell,	1	3.7	3.39	4.0	9.0
Sickle,	5	1.5	5.2	4.8	9.2

PEPPERS. CAPSICUM, SP. (SOLANACEÆ).

The most acrid peppers are crowded with seed. Sweet peppers as a class contain but few seed. Such are also subject to develop a berry or berries within the berry, these enclosed fruit either containing a few seed or entirely seedless. In some varieties, as the yellow Nocera and Spanish Monstrous, seedless specimens are of not unusual occurrence.

PERSIMMON. DIOSPYROS VIRGINIANA, L. (EBENACEÆ).

I have frequently been told of seedless persimmons. Mr. Saunders, Superintendent of the garden at the Department of Agriculture, informs me that he has frequently seen such. Mee-

1 Gard. Chron. Oct. 17, 1885, p. 491.

2 Gard. Chron. 1866, p. 901.

3 Estienne. L'Agric. Maison Rustique, 1570, 133.

4 Budd. in Iowa Ex. Sta. Bull. Nov. 1888, p. 72.

han mentions such in the Botanical Gazette for March, 1885, I think. J. M. Pearson[1] writes, "I have seen some of our native kinds without any seeds, of which the fruit was delicious."

PINEAPPLE. ANANASSA SATIVA. (BROMELIACEÆ).

This is a multiple fruit, only the ovaries or pericarps never or seldom ripen any seeds, but all are blended with the floral envelopes, the bracts, and the axis of the stem they thickly cover, into one fleshy and juicy mass. There are many varieties. In 1768 Taylor described five sorts; in 1737 Miller described five; in 1769 Speechley spoke of fourteen; in 1822 Miller of ten; in 1831 George Lindley of thirty-seven; in 1834 Rogers of nine; Mr. Munroe, a more recent writer, of fifty-two[2] In the Transactions of the Horticultural Society of London, fifty-two sorts are described. The greater number have been introduced into England from abroad, but several have originated from seed in England[3].

This is a typical seedless fruit, none, as Lindley[4] says, except the Enville now and then, having seeds, and this variety, though a large one, is of little value for its delicacy. Pineapples are more frequently seedful under the bad cultivation of the Continent than in the highly kept and skillfully managed pineries of England. New varieties are produced from seed, as was the case with the King pine[5], which was raised from a seed taken from a West Indian fruit. Schomburgk[6] says the wild pineapple in Guiana is small, yellow, aromatic, stringy and full of seeds, rather acidulous in taste. Piso[7] describes a wild *ananas* containing seeds. Humboldt[8] found pineapples of delicious quality growing wild in the Orinoco, and often the seeds were not abortive. Wild pineapples are mentioned by many observers, but nothing is said

1 Ill. Hort. Soc. Trans. 1878, 89.

2 McIntosh, Book of the Garden.

3 Hort. Trans. 2d ser. i. p. i.

4 Theory of Hort., 1859, 170, 171.

5 M'Intosh, Book of the Garden, II. 642.

6 Rawleigh's Disc. of Guian. Hakl. Soc. ed. p. 74, note.

7 Piso, Bras. 1658, p. 196.

8 De Cand, Geog. bot. p. 926, quoted.

about seed in those references we have consulted[1]. A white kind which in the East Indies has run wild, is said by Unger[2] to still contain seeds in its fruit. Hughes[3] in the Barbadoes mentions the seed as being very small and almost kidney-shaped, as if he had seen them. Rumphius notes a semi-wild pineapple in Amboina, bearing seeds, austere and rarely eaten. Arruda in Brazil speaks of a pineapple with small seeds, for the most part abortive[4].

PISTACIA. PISTACIA VERA, L. (ANACARDIACEÆ).

The pistacia, says J. Harlan[5], in his Fruits of Cabul, yields a crop of fruit one year, followed always by a crop of blighted fruit. The latter is like the former in external appearance, but is somewhat larger and quite destitute of kernel.

PLUM. PRUNUS DOMESTICA, L. (ROSACEÆ).

A stoneless variety of the plum is described by Duhamel[6] and by Downing[7], who says the fruit is small, the flesh greenish, harsh, acid, and the kernel without any stone surrounding. As Darwin says[8], the kernel lies in a rough cavity surrounded only by the pulp.

In the richest, sweetest large plums, it cannot have escaped observation, that we have often the splitting of the stone within the fruit, as in the peach.

Prunus Americana, Marsh., is subject in New Brunswick to an anomalous form, which render it seedless and inedible[9]. I have observed this occurrence in Maine, the seed swollen, pulpless, seedless and tasteless. Sometimes the remnant of an embryo is to be found. This monstrosity seems more often to occur when the spring season is cold and rainy[10], and is perhaps due to a fungus attack.

1 Montiero, Angola, p. 101. Afzelius (for Sierra Leone) quoted by Sabine. Hort. Trans. v. 461. Titford (Jamaica), Hort. Bot. Am. p. 54.

2 U. S. Pat. Off. Rept. 1889, 331.

3 Hughes, Barb. 1750, p. 230.

4 Roem-et Schult. 7, 1284.

5 U. S. Pat. Off. Rept. 1861, 533, notes.

6 Duhamel du Monceau, arb. fruit, 1768, ii. 110.

7 Downing, Fruit, 1885, p. 949.

8 An. and Pl. i. 417.

9 Hooker's Journ. of Bot. iii. 99.

10 See Dr. Harris in Hovey's Mag., viii. 247.

An examination of a few samples of plums gave the following figures:

Variety.	*No. Samples.*	*Av. Wt. Fruit Grs.*	*Av. Wt. Seed Grs.*	*Per Cent. Wt. of Seed to Fruit.*
Smith's Orleans,	10	736.0	18.2	2.47
Jefferson,	10	348.4	8.5	2.44
Frost Gage,	8	245.3	8.6	3.50
Suisse,	10	439.0	13.4	3.05
Fellenberg,	10	383.5	17.0	4.43
Golden Gage,	10	379.6	13.9	3.66
Bingham,	10	511.8	25.1	4.90
Blecker's Gage,	10	279.3	13.9	4.98
Hudson's Gage,	10	254.9	13.1	5.13
Pond's Seedling,	10	517.7	19.0	3.67

POMEGRANATE. PUNICA GRANATUM, L. (LYTHRARIEÆ).

This is a peculiar baccate many-celled fruit, having a tough rind formed by the calyx, enclosing two rows of carpels placed above each other. The seeds are immersed in pulp, and are attached irregularly to the parieties, base and center. This pulp is apparently formed by the placentas. It is a fruit in much esteem in many localities in the Orient. Ibn-al-awam[1], a Moorish-Spaniard of the twelfth century, describes eleven varieties.

The pomegranate, with the ancients, was a mystical fruit, on account of the profusion of its seeds, typifying procreation, increase and abundance. There are many varieties. Capt. Burton[2] describes three in Arabia. The *Shami*, almost stoneless, and an exceedingly fine fruit; the *Turki* and the *Misri*, from the context seeding, and not of as fine quality. Barnes[3] says Kaja is famed for its pomegranates without seed, although by far the finest are brought from villages half way up the mountains. The tree only grows in a few Afghan villages. Harlan[4] enumerates the seedless pomegranates from Jillalabod among the fruits in the markets of Cabul. Barnes[5], in his Travels in Bokhara, remarks on the pomegranate seeding in Magenderan as a remarkable peculiarity. In India, the best fruits, having sweet juice and very

1 Le Livre de l'Agric., d' Ibn-al-awam, 1864, i. 252.
2 Pilgrimage to El Medina and Mecca, i. 388.
3 Cabul, 1842.
4 J. Harlan, U. S. Pat. Off. Rept. 1861, 530.
5 Darwin, An. and Pl. ii. 205, note.

small seeds, come from Cabul[1]. Hasselquist[2] observes the inhabitants of Cyprus called a variety having a small stem and barren flowers *Balaustia*. In 1860 cuttings from a seedless variety from Palestine, described as bearing fruit much esteemed in Syria, were distributed from the United States Patent Office[3].

This seedless fruit was mentioned also by the ancients. Pliny[4] says the sweet pomegranates known by the name of *apyrena* are generally considered to be injurious to the stomach. He further describes this *apyrena* as being seedless, of a whiter color than the others, and of a more agreeable flavor. In the Geoponics[5] Africanus gives directions how to raise pomegranates that shall be seedless, and so also does Palladius[6] and Columella[7] from hearsay.

POMELO. CITRUS DECUMANA, L. (RUTACEÆ.)

A seedless variety of the Pomelo is said to be grown in Florida, as Mr. Vandeman informs me.

PUMPKIN. CUCURBITA, SP. (CUCURBITACEÆ).

According to the experience of Ch. Naudin, when the *Cucurbita maxima*, *C. Pepo* and *C. moschata* are crossed, no seed or only sterile seed are produced[8]. I have also observed that the finer quality squashes and *C. moschata* pumpkins contain fewer seed than those of inferior quality. In the Barbadoes[9] there are mentioned by Hughes four kinds, the white, the blue, the marbled and the garden pumpkin. "The latter differs from all the rest by having no seed; but is propagated by slips."

RASPBERRY. RUBUS, SP. (ROSACEÆ).

In some observations made on the number of seed[10] to a berry, the *Davidson's Thornless* averaged 34.2; the *Caroline* 47; the

1 Dutt. Hindw. Mat. Med. 166.
2 Voy. and Trav. in the Levant, 1766, p. 247.
3 U. S. Pat. Off. Rept., 1860, 34.
4 Pliny, lib. xxiii. c. 57; lib. xiii. c. 34.
5 Geoponics, lib. 4. c. 7; lib. 10, c. 31.
6 Pall. lib. 3, c. 29.
7 Col. lib. v. c. 10; also Col. arb. c. 23.
8 Darwin, An. and Pl. i. 430.
9 Hughes, Barb. 1750, p. 137.
10 N. Y. Ag. Ex. Sta. Rept. 1882, p. 80.

Clarke 57.6 seed to a berry. In some reported trials[1] the seedlings from few-berried fruits gave distinctly better quality but smaller size fruit than corresponding seedlings from many-seeded berries. The trials were with *Rubus occidentalis* varieties.

RIBES ALPINUM, L. (SAXIFRAGACEÆ).

Thory says he has often found seedless berries upon whole branches of fruit of this species[2].

SAPPODILLA PLUM. ACHRAS SAPOTA, L. (SAPOTACEÆ).

The medlar-like fruit of the Sappodilla plum, of a milky, quince-like taste, is much esteemed in tropical America and India. It has usually from six to twelve cells with several seeds in each, but Swartz[3] remarks that most of the seed are usually lost by cultivation.

SERVICE. PYRUS LANUGINOSA, DC. (ROSACEÆ).

The flowers and fruit of this tree resemble those of the mountain ash, but are smaller, the flowers are frequently abortive, and the fruit, when it is produced, is generally without seeds.

STRAWBERRY. FRAGARIA, SP. (ROSACEÆ).

In this fruit the enlarged and conical receptacle bearing the pistils on its surface, becomes the edible portion in fruit. The varieties are endless, and the various classes have been referred to different species. Merrick,[5] in 1870 catalogues eight hundred and thirteen kinds. The name *Strawberry* refers to the running stems strewed (anciently *strawed*) over the ground. This reminds us of Virgil's description " * * humi nascentia fragra." Servius Grammaticus, A.D., 412, calls them "fructus terra et mora terrestria," the equivalent of which is found in the Swedish and Danish name of *jordbar*, earth berry. Pliny's name was also *terrestris fraga*, ground berry. The earliest picture of the strawberry that I possess is in Herbarius cum Herbarium, Mogwntiæ, 1484, chap. lxiii., which is evidently of *Fragaria vesca*, as

1 N. Y. Ag. Ex. Sta. Rept. 1885, 257. See also ib. 1855, 257.
2 Thory. Grosseilier, 20.
3 Miller's Dict., Ed. of 1807.
4 Loudon, Arb. p. 924.
5 Strawberry Cultur. 1870.

the fruit is borne above the leaves. The figure is a rude one, but recognizable.

A mule plant from the Hautbois and Alpine strawberry, says Knight[1], blossoms very freely and its blossoms set well; but the growth of the fruit subsequently remains very nearly stationary during the whole period in which the Hautbois strawberry grows and ripens; after which it swells and acquires maturity. It is then rich and high flavored, but of less size than the Hautbois, and without seeds. Duchesne[2] remarks upon the sterility of the Breslinge, known in France under the name of *Covcov.* It is not completely sterile, however, but has produced a strawberry of fine flavor, the *Fraises mignones.* Mr. Saunders of the Department of Agriculture at Washington, told me February 16th, 1880, that he once had a bed of pistillate strawberries which fruited but bore no seed; the quality was fine. In my own trials I have found that the most superior varieties have contained fewer seeds to the berry than other varieties of inferior quality.

In some countings of seed[3], fine specimens averaged seed to a berry as follows: Hervey Davis, 115; Triumph de Gand, 152; Monarch of the West, 232; Sharpless, 239. This corresponds in order very closely to the quality. Small, inferior samples of Wilson's Albany, however, had but seventy-two seed to a berry.

TOMATO. LYCOPERSICUM ESCULENTUM, MILL. (SOLANACEÆ).

It is a matter of common observation that the finest quality tomato fruit contains fewer seed than do those of inferior varieties. Burr[4] also says there is a seedless variety, smooth and handsome, with few seeds.

A fair sample of four varieties gave seed as follows:

Variety.	*Wt. of Fruit Grs.*	*Seed to a Berry.*	*Wt. of Seed Grs.*	*Per cent. Seed to Berry.*
Mayflower,	1419	244	6.5	.38
Paragon,	3834	531	21.6	.56
Trophy,	3208	476	22.6	.70
Early Acme,	3449	491	24.7	.71

1 Knight, Phys. and Hort. Papers, p. 276.

2 In Lam. Enc. Meth. 1786, ii. 535.

3 N. Y. Agric. Ex. Sta. Rept. 1882, p. 80.

4 Garden Vegetables, p. 208.

WATERMELON. CITRULLUS VULGARIS, SCHRAD. (CUCURBITACEÆ).

The watermelon was observed by Caesalpinius[1] in 1583, in a seedless state, and this is quoted by Bauhin in 1596 and 1623, as alss by J. Bauhin in 1651. I find no other recorded instance.

In the above list of sixty-one species, we find quality either stated or inferred, in varying degrees, in the case of thirty-three; in the remaining twenty-eight either no, or insufficient, mention. It is more than probable that in every case of high development, for thus we class horticultural selections, the seed is changed in some respect from the seed of the wild type, either recognizable in reduction of number, size, weight or fragility. In many instances, such as the melon and tomato, the orange and the peach, and many others, this is effected through corelations, the horticulturist indifferent to the seed, but keen for the quality of juiciness, tenderness and flavor. It seems a legitimate field for horticultural effort, to experiment with seed from nearly seedless forms, or with seed which is more fragile or seemingly imperfect, in the endeavor to produce increased quality, as also with seed from unripe fruit.

1 Caesalpinus, lib. 5, c. 5, p. 200.

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